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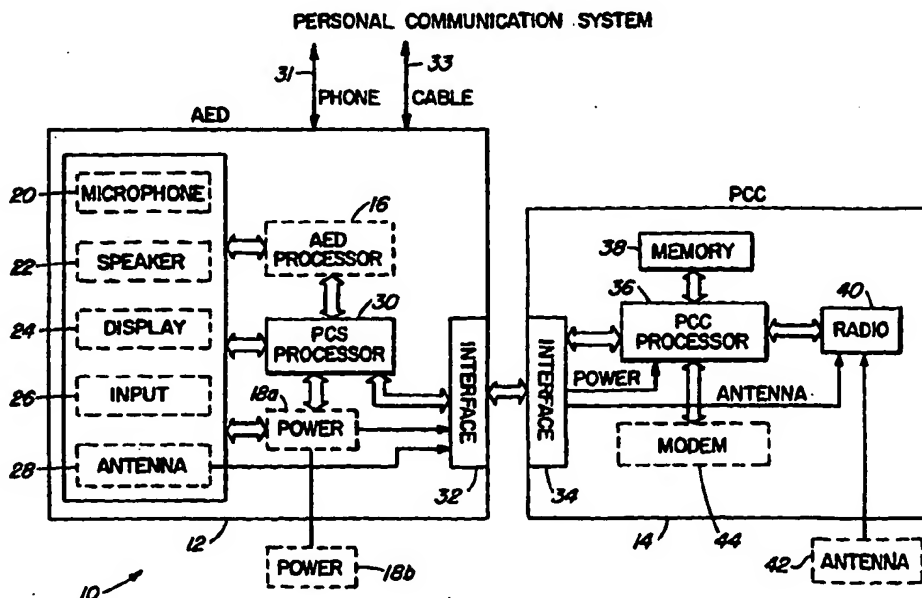


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(54) Title: PERSONAL COMMUNICATIONS SYSTEM



(57) Abstract

A modular radio communications system is described for providing radio communication capabilities through a plurality of different audio equipment devices (AED). The system includes a portable communication card (PCC) which may interface with a number of different electronic devices such as computers, portable telephones, car, home or portable radio systems, portable compact disk or cassette players, televisions, video cameras, and one-way or two-way messaging devices wherein each device has been adapted to communicate with the portable communications card.

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Personal Communications System

A modular radio communications system is described for providing radio communication capabilities through a plurality of different audio equipment devices (AED). The system includes a portable communication card (PCC) which may interface with a number of different electronic devices such as computers, portable telephones, car, home or portable radio systems, portable compact disk or cassette players, televisions video cameras, and one-way or two-way messaging devices wherein each device has been adapted to communicate with the portable communications card.

BACKGROUND OF THE INVENTION

Consumer electronics products are numerous and widespread in use and functionality. Products such as televisions, radios, cassette players, compact disk players, cellular telephones, home phone systems, video cameras and computers are purchased in huge numbers each year. Generally, a consumer purchases a product to perform a specific function or a limited range of functions. While each product may have a number of elements common to other products such as speakers, microphones, input devices and displays, separate products are purchased for the primary function of the product.

In recent years, there has been a large increase in the use of radio products, both receiver products and transceiver products. Examples of receiver products include televisions, radios including AM, FM, SW, MB and GPS and transceiver products such as cellular phones and CB and VHF radios.

It is also well known that certain electronics products such as cellular telephones quickly become obsolete with respect to the communications technology therein, requiring replacement of entire cellular phones as technologies change. For example, the cellular industry is currently seeing the movement from AMPS (analog) to CDMA/TDMA/GSM(USA)/GSM(Europe) digital as well as the introduction of dual mode AMPS/CDMA AMPS/TDMA, or even tri-mode AMPS/CDMA/GSM, for

example. This constant shifting in cellular technologies results in large numbers of phones being replaced within short periods of time, as little as one year in many instances which is enormously inefficient to the consumer with respect to capital outlay.

5

With advances in communications technologies, and in particular, the miniaturization of electronic processors, the addition of functionality to a processor can be achieved without significant increases in the volume or power requirements of the processor.

10 Accordingly, there has been a need for a system which overcomes the problems of radio communication through completely separate consumer products and more specifically, there has been a need for a system which places the primary radio communications functionality on a portable communications card and which permits the integration of the communications card within a host of audio equipment devices
15 (AED's).

More specifically and with respect to cellular phones, the cellular phone provides the user with a highly convenient and efficient form of communication enabling the user to communicate from almost all locations within a cellular network. Cellular phones
20 are generally utilized by the business person as a business tool or by an individual for convenience and security.

In recent years, advances in the miniaturization of cellular phones have resulted in a large increase in their use as the phones have become smaller and more portable as
25 well as becoming less expensive. At the present time, the more popular phones on the market are those which are hand-held with an overall size in the range of a 6 inches long, 3 inches wide and 1 inch thick. These phones generally include rechargeable battery packs to provide the necessary power for portability.

30 These advances in miniaturization have also led to a decrease in the use of specific cellular phones, such as those specifically designed for use within an automobile as

greater overall convenience to the consumer can be achieved with a fully portable unit. These same trends in miniaturization can also be seen in other electronics equipment including radios, stereos, computers, telephones and the like.

- 5 While individual electronic products are made smaller, there exists an inherent inefficiency with respect to this hardware, wherein various electronic systems cannot interact with one another and share common features, if appropriate. This ultimately results in a duplication of hardware with the consumer purchasing separate components which perform the same functions.

10

- For example, while cellular phones continue to be made smaller, certain disadvantages continue to remain in their structure and use. Principally, cellular phones require unique power packs, display screens, keypads and antennae to operate, with each phone being built according to the specific standard associated with a particular manufacturer. For example, the power packs developed for use with one phone system cannot be used with another phone system. As well, a cellular phone power pack can usually only be recharged by connection to a specific manufacture's recharging unit. Similarly, power packs for portable computers, portable cassette or compact disk players are not interchangeable with one another.

20

- In the business world, a business person may, in addition to a cellular phone, be carrying additional hardware to form a virtual office, such as a portable computer, a paging unit and possibly other electronic hardware such as a dictation machine. For each piece of hardware, auxiliary power packs or chargers may be required adding to the overall volume and weight of the business hardware and leading to situations where a briefcase is filled strictly with the various peripheral pieces of charging hardware. Thus, the requirement for multiple pieces of peripheral hardware detracts from the overall portability of the hardware.

25

- In the particular example of a cellular phone, while the cellular phone is supposed to be fully portable, in reality, it requires the accompanying baggage of auxiliary power

packs or chargers to ensure operability and reliability to the user. This often leads to situations where the desired hardware component cannot operate because of a lack of power either because the hassle of carrying an auxiliary power pack or charger caused the auxiliary power pack or charger to be left behind or wherein power cannot be
5 utilized from another piece of equipment such as a portable computer.

In the personal-use setting, a user is most likely to require a cellular phone while in their car, while walking or exercising. Again, in that cellular phones are generally not adapted for use in a car, the use of a portable phone in the car may be ineffective and,
10 if used while the user is driving, compromise the user's driving attention.

Furthermore, while walking or exercising, a person may desire to use a portable compact disc or cassette player as well as carry a cellular phone. However, because of the separate components, one or other of the pieces of equipment may be left behind.

15 Thus, in both the business or personal-use setting, numerous situations exist where portability requires a number of pieces of auxiliary hardware and the user may decide against carrying a cellular phone because of the inconvenience of the auxiliary hardware.

20 Thus, there has been a need for a personal communications system which overcomes the above problems providing a communications system that is adaptable to various environments in which a cellular phone is required and the hardware with which the cellular phone may be used in association or simultaneously with.

25 In particular, there has been a need for a cellular phone system which provides the convenience of a standard battery powered cellular phone that can also be conveniently and efficiently adapted to other hardware such as computer systems including portable computers and personal computers, radios including car radios, home stereo systems and portable radios such as portable compact disc or cassette
30 tape players, standard and wireless telephone systems, televisions and other audio equipment devices.

In the past, standardized systems for interfacing among electronic hardware have included such formats as the Personal Computer Memory Card International Association (PCMCIA) format. Such standardized interfacing formats define specific physical dimensions of a card enabling various manufacturers to produce electronics equipment which, if conformed to this standard may be used in different manufacturer's equipment.

Furthermore, and more specifically, in that the use of personal communication systems is continuing to grow, there has been a need for a communication system in which a person has a single and unique identification number or telephone number which enables contact anywhere in the world while providing flexibility between different forms of hardware. In the development of such a system, there has been a need for a system that minimizes the personal hardware requirements to an end-user to provide high levels of flexibility to the user as well as security.

As indicated above, the various hardware components which may be used in conjunction with a radio or cellular phone often duplicate some or all of the various sub-systems which define each system. For example, personal computers have power, speakers, microphone, displays and keypads, cars have radio systems which include power, keypads/button controls, speakers, volume controls, displays and antenna, portable compact disk or cassette stereo systems have power, speakers, keypads, volume controls, and displays, stereo systems have power, speakers, volume controls, displays and antenna, answering machines have power, speakers, and microphones and fax machines have power and speakers, televisions have power, keypads, speakers, volume controls, displays, antennae and coaxial cable with FM band input and video cameras have power, speakers, volume controls, and displays.

Accordingly, there has been a need for a system wherein the radio receiver/transceiver electronics of a radio or cellular phone are integrated onto a single card and adapted for use with a plurality of different electronics and telephone equipment in which the additional electronics and telephone equipment can effectively interface with said

equipment through the development of a highly flexible and efficient interfacing standard.

Still further, there has been a need for a new series of AED's which are adapted to
5 receive a PCC wherein the functionality of the AED's, are increased only when a PCC
is present.

Still further, there has been a need for a personal communications system in which
user information, such as telephone numbers and security information, is contained
10 within a portable communication card so that such information is stored in a single
location as opposed to being stored on a number of different devices.

Still further, there has been a need for a personal communications system in which in
addition to providing cellular or radio frequency communication, a portable
15 communication card can activate different audio equipment enabling wireline
telephone network, cable network and/or video communication through different
audio equipment devices.

A review of the prior art indicates that such a system has not been developed.

20

United States Patent 5,550,861 discloses a computer peripheral combining the
functionality of multiple devices including a pager, a fax machine and a data modem.
The patent discloses a PCMCIA format card containing modem circuitry and
telephone interface circuitry which may be connected either to a portable computer or
25 modular components of a pager. This patent also describes circuitry which enables
selective communication between the computer and fax/modem or the pager. This
patent does not disclose a system enabling radio telephone communication through a
plurality of different audio equipment devices.

30 United States Patent 5,512,886 describes a paging system having a selective call
receiver with computer interface capable of receiving at least one message and

communicating the at least one message to an electronic information processing device and a proposed standardized communication interface. This patent does not disclose a system enabling radio telephone communication through a plurality of different audio equipment devices.

5

United States Patent 5,537,558 describes an apparatus enabling communication between a personal computer and other devices which may have the same or different operating protocols through a PCMCIA interface. This patent does not disclose a system enabling radio telephone communication through a plurality of different audio

10 equipment devices.

SUMMARY OF THE INVENTION

In accordance with the invention a personal communications system (PCS) for enhancing the communications capabilities through a plurality of different audio equipment devices (AED) having a primary functionality is provided, the
5 communications system comprising:

a portable communications card (PCC) , the portable communications card including:

radio communications means, the radio communications means including any one of or a combination of radio receiver or radio
10 transceiver means;

PCC processor means operatively connected to the radio communications means and a communication card interface, the PCC processor means for establishing operative communication between the
15 radio communications means and an audio equipment device through the communication card interface; and

wherein the audio equipment device (AED) has power, speaker, input and display means operatively connected to a PCS processor and AED interface
20 means, the AED interface means adapted for operative connection to the communication card interface wherein the PCS processor includes means for over-riding the primary functionality of the AED and means for controlling radio communication through the AED when the PCC is connected to the AED through the AED interface means and communication card interface.

25 In further embodiments, the radio communication means is selected from any one of or a combination of radio frequency (RF) telephone transceiver means, AM receiving means, FM receiving means, MB receiving means, SW receiving means, PM receiving means, CB transceiver means, video receiving means, satellite receiving
30 means, and GPS receiving means.

In still further embodiments, the means for controlling radio communication includes means for controlling wireline telephone communication through the wireline telephone network and the AED includes wireline telephone network interface means operatively connected to the PCS processor and/or the means for controlling radio
5 communication includes means for controlling cable telephone communication through the cable network and the AED includes cable network interface means operatively connected to the PCS processor.

Still further, the AED may be adapted to communicate with two or more PCC's.
10

In yet other embodiments, the PCC processor means includes non-volatile memory means for storing user specific information.

The invention also provides a portable communications card (PCC) for providing
15 radio communication capabilities to a plurality of different audio equipment devices (AED) having a primary functionality, the PCC comprising:

radio communications means, the radio communications means including any one of or a combination of radio receiver or radio transceiver means;
20

PCC processor means operatively connected to the radio communications means and a communication card interface, the PCC processor means for establishing operative communication between the radio communications means and an audio equipment device through the communication card
25 interface.

In further embodiments of the PCC, the radio communication means is selected from any one of or a combination of radio frequency (RF) telephone transceiver means, AM receiving means, FM receiving means, MB receiving means, SW receiving
30 means, PM receiving means, CB transceiver means, video receiving means, satellite receiving means, and GPS receiving means.

In still further embodiments, the PCC includes PCC antenna means adapted for operative connection to the PCC for providing antenna function to the PCC and associated AED and/or modem means operatively connected to the PCC processor..

- 5 In a preferred embodiment, the communication card interface is an infrared interface.

The invention also provides an audio equipment device (AED) for use within a personal communications system (PCS), the AED having a primary functionality and adapted for operative connection to a portable communication card (PCC) to enable
10 radio communication through the AED, the AED having power, speaker, input and display means operatively connected to a PCS processor and AED interface means, the AED interface means adapted for operative connection to the PCC wherein the PCS processor includes means for over-riding the primary functionality of the AED and means for controlling radio communication through the AED when the PCC is
15 communicating with the AED.

In further embodiments of an AED, the PCS processor includes echo cancellation means and/or means for controlling wireline telephone communication through the AED and wireline telephone interface means for connecting the AED to a wireline
20 telephone system and/or means for controlling cable telephone communication through the AED and cable network interface means for connecting the AED to a cable telephone system

In a preferred embodiment, the AED interface is an infrared interface.
25 .

In still further embodiments, the AED further comprises an auxiliary headset means containing auxiliary speaker and auxiliary microphone means, the auxiliary headset adapted for operative connection to the PCS processor.

30 In still further embodiments of the AED the input means is selected from any one of or a combination of keypad means, voice recognition system (VRS), mouse input

device, pen input device, trackball input device, touch pad, touch screen, force pad or force stick and/or the display means is selected from any one of or a combination of liquid crystal display (LCD), light emitting diode (LED), cathode ray tube (CRT), electroluminescent panel (EL) or fluorescent indicator panel (FIP)

5

In one specific embodiment, the interface standard is PCMCIA.

The invention also provides specific AED's including a personal computer, a portable phone body, a car radio, a portable compact disk player, a portable cassette player, a
10 portable radio, a television, a video camera, a one-way messaging device, a two-way messaging device, a phone, a fax machine, and an answering machine.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings wherein:

5 **FIGURE 1** is a block diagram showing the various modules of the communications system in accordance with the invention;

FIGURE 2 is a block diagram of a computer in accordance with the PCS;

10 **FIGURE 3** is a block diagram of a portable phone in accordance with the PCS;

FIGURE 4 is a block diagram of a car, home or portable radio system in accordance with the PCS;

15 **FIGURE 5** is a block diagram of a portable compact disk or cassette player in accordance with the PCS;

FIGURE 6 is a block diagram of a television in accordance with the PCS;

20 **FIGURE 7** is a block diagram of a video camera in accordance with the PCS;

FIGURE 8 is a block diagram of a one-way messaging device in accordance with the PCS;

25 **FIGURE 9** is a block diagram of a two-way messaging device in accordance with the PCS;

FIGURE 10 is a block diagram showing a payphone/home phone system in accordance with the PCS;

30

FIGURE 11 is a block diagram showing a fax machine in accordance with the PCS;

FIGURE 12 is a block diagram showing an answering machine in accordance with the PCS;

FIGURE 13 is a block diagram showing network connections in accordance with one
5 embodiment of the PCS.

DETAILED DESCRIPTION OF THE INVENTION

With reference to Figure 1, a modular personal communications system (PCS) 10 is described. Generally, the personal communications system comprises a portable communication card (PCC) 14 and audio equipment devices (AED) 12. Both the PCC and AED are adapted to provide radio communication capabilities through different AED's which may not normally have radio communication capabilities. In accordance with the invention and as described below, an AED may include but is not limited to such devices as personal computers, including desktop and portable devices, portable phones, radios including car radios, home entertainment systems and portable radios, portable compact disk or cassette players, televisions, fax machines, answering machines, portable messaging devices and video cameras. A PCC includes radio communication functionality such as but not limited to radio frequency (RF) telephone transceiver means, AM receiving means, FM receiving means, MB receiving means, SW receiving means, CB transceiver means, video receiving means, satellite receiving means, and GPS receiving means.

For the purposes of general description, an audio equipment device 12 includes an AED processor 16 which controls the basic operation of the AED. Accordingly, each AED has a primary function, for example to operate as a car radio or television under the control of the AED processor. As such, each AED will include a power source 18 internal (18a) and/or external (18b) to the AED. An AED for the purpose of its primary function also includes various combinations of input/output devices including but not limited to a microphone module 20, speaker module 22, display module 24, input module 26, and antenna module 28. Various AED's, as described below in greater detail, may or may not inherently include each of the above modules within the basic AED structure for its primary function. Accordingly, in the event that a particular AED does not inherently include one or more of the above modules, in order to provide PCS functionality, the functionality associated with each of these modules is provided internally or externally to the basic AED structure.

An AED 12, in accordance with the invention, includes a PCS processor 30 which controls operation of the AED 12 within the PCS system. Accordingly, the PCS processor 30 is operatively connected to AED processor 16 (or is a logical function running on the AED processor in the case of a personal computer), the power module
5 18 and the input/output devices including microphone module 20, speaker module 22, display module 24, input module 26, and antenna module 28. The PCS processor 30 is also operatively connected to an AED interface 32 for enabling AED communication with the PCC 14 and the AED power module 18.

10 The AED 12 may also include wireline telephone network interface 31 and/or cable network interface 33 for providing AED connection to either a wireline telephone network or cable network.

The PCC 14 includes a communication card interface 34 operatively connected to a
15 PCC processor 36, the PCC processor 36 for controlling the operation of the PCC 14. The PCC processor 36 is connected to a radio frequency (RF) module 40 and, preferably, an internal memory module 38. The RF module 40 may also be connected to a PCC antenna module 42. Still further, the PCC may include a modem module 44 internal or external to the PCC or as an integral component of the PCC processor 36.

20 The PCC 14 may be connected to the AED 12 by mating the PCC interface 34 to the AED interface 32 to provide communication capabilities which would normally not be associated with the primary function of an AED 12. As described more fully below the connection between the AED 12 and PCC 14 may be wired, wireless or a
25 combination of wired and wireless.

The PCC 14 when connected to an AED 12 will communicate with the AED processor 30. The complexity and implementation of the AED processor and its software may vary for different AED's depending on the number of input/output
30 modules a particular AED may have.

A description of the various modules of an AED follows:

AED Power Module 18

The AED power module 18 provides power to the AED 12 for the AED's primary
5 function as well as providing power to the PCS processor 30 for PCS operation.
Indirectly, that is through the PCS interface (32, 34) the AED power module provides
power to the PCC for PCC operation. Power module 18a would typically be an
internal battery or power supply and power module 18b would typically be an AC
mains connection. Appropriate power converters are provided in each AED to provide
10 a uniform power standard to the PCC. In various embodiments of the invention, the
AED power module 18 may also provide a voltage signal to the AED processor for
the AED processor to check the status of the power source and/or a time remaining
signal to the AED processor to report time remaining on the power supply, if
applicable.

15

Microphone Module 20

The microphone module 20 provides audio input from a user into the AED 12 for
PCS operation and primary AED operation, if applicable, and preferably is a standard
microphone as may be configured within an AED 12.

20

In an alternate embodiment of the invention, audio input processed by the AED
processor could provide the equivalent function to a keypad module for example
through voice recognition based commands.

25 ***Speaker Module 22***

The speaker module 22 provides audio output from the AED 12 when the AED is
functioning both within the PCS and for its primary AED function, if applicable.

30 Within the PCS, the speaker module 22 provides an incoming call signal to alert the
user of an incoming call and, subsequently, provides audio output to the user during

PCS operation. Preferably, the speaker module is a standard speaker as may be configured within an AED.

Display Module 24

5 The display module 24 displays information relevant to the primary function of the AED as well as information relevant to PCS operation. The AED display module 24 is specific to the particular AED but will typically be either a liquid crystal display (LCD), light emitting diode (LED), electroluminescent panel (EL), fluorescent indicator panel (FIP) or cathode ray tube (CRT).

10

Input Module 26

The input module 26 enables a user to operate the AED 12 for its primary function or within the PCS. The input module enables a user to input commands to the AED processor 16 and to the PCS processor 30. Preferably, the input module 26 will
15 include an alphanumeric keypad with associated function keys.

In alternate embodiments, the input module 26 may provide non-keypad input devices such as a voice recognition system (VRS) as a component of the PCS processor and microphone module, a mouse input device, eye tracking, force tracking, touchscreen,
20 pen input device or trackball input device.

Antenna Module 28

The antenna module receives radio frequency signals for the primary AED function, if applicable, as well as for PCS operation.

25

Wireline Telephone Network Interface 31

The AED 12 may also be provided with a wireline telephone network interface 31 enabling the AED to be connected to the wireline telephone network system. The wireline telephone network interface would typically be a standard telephone jack
30 which is operatively connected to the either or both of the AED processor 16 and PCS processor 30.

Cable Network Interface 33

The AED 12 may also be provided with a cable network interface 33 enabling the AED to be connected to the cable network system. The cable network interface would typically be a standard coaxial cable jack which is operatively connected to the either
5 or both of the AED processor 16 and PCS processor 30.

PCS Processor 30

The PCS processor 30 generally controls the operation of both the AED 12 and PCC 14 within the PCS. Generally, if a PCC 14 is present within an AED host, the PCS
10 processor 30 enables operation of the PCS. The PCS processor 30 may be a physically separate processor to the AED processor or, alternatively, an integral component.

Generally, the PCS processor 30 receives power from the power module 18 and, preferably, determines the adequacy of the power supply. In various embodiments, the
15 PCS processor may calculate the time remaining in a battery and if insufficient or weak provides an audio or visual signal to the speaker module 22 or display module 24 as appropriate to notify the user of this condition.

The PCS processor 30 activates and controls the microphone module 20 and speaker
20 module 22 for PCS operation while deactivating the use of the microphone module 20 and speaker module 22 for non-PCS operation if these modules are not required for primary AED function.

The PCS processor 30 activates and controls the display module 24 for PCS operation
25 and disables the display module 24 if not required for primary AED function.

The PCS processor 30 receives input signals to initiate outgoing PCS operation (outgoing calls) by a user and also activates and controls the input module for PCS operation (incoming calls).

Generally, in the case of a PCC adapted to enable telephone communication, the PCS processor 30 and/or radio module 40 checks for the existence of a wireline telephone network connection, cable network connection or AED antenna module 28. If a wireline telephone or cable network is found, PCS communication may proceed over these networks. Alternatively, if neither a wireline telephone network connection or cable network connection is found and an antenna module 28 is found, the radio module 40 checks for signal strength. If adequate, the radio module 40 enables PCS operation with the AED antenna module 28. If the signal strength is inadequate and a PCC antenna module 42 exists, the radio module 40 decides if the PCC antenna module 42 has sufficient signal strength for PCS operation. If neither a AED antenna module 28 nor a PCC antenna module exist, the PCS processor does not permit PCS operation.

As indicated above, alternative to a radio frequency mode of operation for telephone communication, the PCS processor 30 may permit operation of the AED over a wireline telephone network or cable network. Accordingly, in this embodiment, the PCS processor 30 may independently decide to communicate via the wireline telephone or cable networks, or alternatively, be instructed by user input to use a specific network.

The PCS processor 30 may be activated by the AED processor 16. For example, the PCS processor function may be a communication program running under a WINDOWS operating system and thus, the communication program must be launched by the AED processor 16 in order to operate.

The PCS processor 30 checks for the presence of a PCC 14. Upon connection, the PCS processor 30 determines the viability of the connection with the PCC processor 36. In addition, the PCS processor checks for the presence and operability of the AED power, microphone, speaker, display, input and antenna modules. The PCS processor may also check the status of the AED processor 16, PCS processor logic and/or PCC processor logic, if applicable.

Alternatively, if a PCC is present, and the PCS processor 30 determines that an operative connection exists with the wireline telephone network and/or cable network through the wireline telephone network interface 31 or cable network interface 33, the PCS processor may communicate via these networks as opposed to via a cellular
5 network.

If there is no connection between the PCC and AED, the PCS processor 30 resides in a first standby mode wherein the PCS processor 30 continues to check for the presence of a PCC.

10 If a PCC 14 is present and the status of the connection is OK, the PCS processor 30 will reside in a second standby mode wherein the PCS processor 30 is waiting for call to be received or initiated. If a PCC 14 is present and the status is not OK, the PCS processor 30 will provide an audio or display signal to the speaker module 22 or
15 display module 24, if possible

While in the second standby mode, if an incoming call is detected, the PCS processor 30 will enter an interrupt mode (or foreground or primary pre-emptive mode in the case of a computer) wherein any primary AED function utilizing the microphone,
20 speaker, display and/or input modules will be interrupted or disabled. Thereafter, the PCS processor 30 will activate the speaker module 22 providing the appropriate ringing signal and activate the display module 24 and input module 26, as appropriate. If a user is available to receive the incoming call, the user will press an appropriate key (or other input mechanism) on the input module 26 to open the call. Alternatively,
25 the PCS processor 30 may be provided with an auto answer function for fax, voice mail or data functions.

If while in the second standby mode, the user wishes to initiate an outgoing call, the AED is placed in an outgoing mode typically by selecting a function via the input
30 module 26. If an activation signal is received, the PCS processor 30 activates the

microphone module 20, speaker module 22, display module 24, input module 26 and antenna module 28 or 42, as appropriate enabling an outgoing call to be placed.

Generally, the PCS processor 30 commands the PCC 14 to dial numbers, end calls,
5 power up, power down, recall phone numbers, and answer incoming calls.

The PCS will use standard cellular telephone logic which may include specific security logic as described below in greater detail.

10 In addition, the PCS processor 30 may include additional functions providing convenience and flexibility to the PCS particularly by providing a choice of communication network to the user.

Insertion of PCC into an AED and Geometry of Interface

15 With the PCC fully inserted into the PCC docking slot on the AED, the AED functionality increases to include wireless communication. Connectors within the PCC docking slot on the AED preferably provide the PCC with DC power and an optional external antenna connection.

20 In one embodiment of the PCS, a PCMCIA standard (or related or modified standard) is used between the AED and PCC. While a PCMCIA interface may be preferred for some AED's, other interface standards may be used or developed in accordance with the invention as described below.

25 For example, a standard PCMCIA interface may be supplemented with additional connectors. In a personal computer, the PCMCIA interface is essentially a data bus extension to the PC processor bus, therefore the microphone and speaker signals would be transferred digitally across the interface. Therefore, there is not an analog physical interface on PCMCIA to speakers and microphone. Accordingly, in order to
30 maximize the effectiveness of the PCS system, the interface may include analog

signal capabilities to carry, for example, microphone and speaker signals, where applicable.

5 In an alternate embodiment, the PCS uses an infrared data link between the AED and PCC. The IR link enables the transmission of data between an IR port on the AED and an IR port on the PCC. Preferably, when the PCC is docked in the AED, it automatically powers-up the PCC after which the PCC processor 36 will begin to send data to the AED.

10 An IR link addresses the typical problems of short life expectancy and inconsistent electrical contact specifically resulting from vibration experienced with mechanical connectors. With IR ports located less than 2 inches apart, these problems are virtually eliminated. Power delivered to the PCC would, however, in most instances require a mechanical connector.

15 Still further, an IR link may enable communication without physical interconnection of the PCC with the AED wherein the PCC may be placed facing the AED to establish communication over distances up to approximately 6 feet such as in a car or across a room. In this regard, the PCC would be positioned away from the AED and would communicate in direct line of sight with the AED. Accordingly, in this
20 embodiment, the definition of docking between the AED and PCC means operative communication between the AED and PCC when the AED and PCC are in close proximity to one another. In this embodiment, the PCC would require an integral or alternate power source.

25 Infrared communication may be established using an IRDA (infra red digital access) protocol enabling data transfer rates of approximately 4Mb/sec, sufficient to carry real-time voice, video, compressed video and data.

30 ***Portable Communications Card (PCC)***

The PCC 14 enables operation of an AED 12 within the PCS. Physical connection of the PCC within an AED initiates the procedures for PCS communication. The PCC provides the fundamental portability to the PCS, providing the user with a single component which may be carried and interfaced with many AED's. As such, and in
5 consideration of any security features which may be included, the PCC will likely provide the necessary information to various service providers concerning identification for billing and operation within the PCS. The PCC may include "smart card" functionality.

10 Once docked, the PCC communicates to the AED its technology identifier, that is the type of wireless communication the PCC is utilizing (including but not limited to; AMPS, NAMPS, ETACS, JTACS, Digital Cellular, Specialized Mobile Radio, Citizen Band Radio, Short Wave, Satellite). The AED uses this information to enable the correct display, and keypad functions required for each radio type.

15 In the event that a PCC with digital cellular radio and smart card functionality is inserted into the AED docking port, the instructions on the smart card will define the PCC's capabilities. For example, if the smart card has restricted calling to only one phone number then any phone call made through the AED will go to that phone
20 number regardless of the phone number dialed and shown on the AED display. The additional information which the PCC will send to the AED includes (but is not limited to); Roam status, Service status, Signal Strength, Carrier being utilized (A or B), Incoming Voice Call, Short Messaging Service, and Caller ID. The information which the AED will send to the PCC consists of (but is not limited to); telephone
25 numbers (0-9, # and *), Send, End, and Alpha text (entire alphabet in multiple languages). The PCC will store information such as addresses, dates, telephone numbers etc., which the user would like to have carried from one AED to another other within the PCC.

30 *PCC Processor 36*

The PCC processor 36 controls the operation of the PCC and interacts with radio module 40. The radio module 40 may be a receiver or a transceiver. The PCC processor 36 may also interact with a modem module 44 or perform modem functions directly.

5

The PCC processor 36 acts either as an integral part of the radio module 40 or as a separate controller translating AED commands and call setup instructions into commands for the transceiver module 40 or data modem interface 44, if applicable.

10 The PCC may also include an internal PCC power supply, if necessary.

The PCC processor 36 may also include an associated memory module 38 including read-only memory for system set-up and security and random-access memory for storage of telephone information relevant to a specific user. Random-access memory
15 may be volatile in the event a PCC power supply is utilized or, alternatively, non-volatile, for example flash EPROM.

PCC Radio Module 40

Transceiver

20 As a transceiver, the PCC radio module 40 provides standard cellular transceiver functionality to the AED 14 and is controlled by the PCC processor 36. The transceiver module 40 contains a processor which controls the air interface protocols for the cellular system and has the ability to establish, maintain and terminate calls on the cellular system. The transceiver module 40 may control one or more of known air
25 interface standards including EIA/TIA-553 (standard analog North American Cellular), EIA/TIA IS-54 (North American analog and TDMA cellular), EIA/TIA IS-136 (Advanced North American analog/TDMA cellular), EIA/TIA IS-88 (Narrow and Wideband analog cellular), EIA/TIA IS-95 (North American CDMA cellular) and various international standards including GSM, CT2, CT2+ and DECT. It is
30 understood that other air interface standards may be implemented as appropriate.

Alternatively, the radio module may provide two-way radio communication utilizing CB, VHF or other radio frequency protocols.

Receiver

- 5 The PCC radio module may be a receiver only enabling AM, FM, CB, MB, SW radio communication.

PCC Antenna Module 42

- The PCC Antenna Module 42 provides antenna functions to the PCS, if necessary.
- 10 Preferably, the PCC antenna module 42 will mechanically connect to the PCC through an appropriate connector either directly or through an adaptor (not shown). The radio module 40 defaults to an AED antenna module, if present and operable. If an AED antenna module 28 is not present or inoperable, the radio module 40 will search for a wireline telephone or cable network or PCC antenna module 42, as
- 15 appropriate.

PCC Shielding

- It may also be necessary to provide the PCC with shielding in order to prevent problems in the operation of an AED whose primary function is radio based.
- 20

PCC Power Module

- It may also be desired to include a power module in the PCC in order that the PCC processor may be operative for short periods of time when not docked with an AED. For example, a video call could be received on an AED, such as a portable cassette
- 25 player which would not display the video data. Accordingly, it is contemplated that the PCC would have sufficient power to enable a call to be moved to an appropriate AED without disconnecting the call.

Audio Equipment Devices (AED)

- 30 As described above, an AED 12 used in accordance with the invention may include but are not limited to devices such as personal computers, including desktop and

portable devices, portable phones, radios including car radios, home stereo systems and portable radios, personal compact disk or cassette players, televisions, fax machines, answering machines, messaging or paging systems and video cameras.

- 5 With reference to Figures 2-10, various AED's are described in accordance with the invention. In each case, the AED can be designed to support both receiver and transceiver functionality. With respect to transceiver functionality, the AED may support both incoming or outgoing calls or limited to receive incoming calls only or, alternatively, only support outgoing calls. For example, a portable cassette or compact
10 disk player may be designed to support outgoing calls in emergency situations only or alternatively, be designed to support incoming calls only enabling a user to be contacted either with incoming telephone calls or messaging functions.

Echo Cancellation

- 15 In certain AED embodiments, echo cancellation functionality will be required to limit the effect of acoustic feedback between speakers and microphones in order to permit operation of both microphone and speakers within an open space or room (that is, duplex communication). In particular, echo cancellation functionality will be required for any AED which does not necessarily require the use of a head set such as a car
20 radio, portable radio, computer, portable cassette or CD player or video camera. In each case, a jack for the use of a headset may be provided on the AED but in each case the use of echo cancellation technology would enhance the functionality of the AED.

Computers and Portable computers

- Figure 2 shows a computer 50 operative within the PCS 10. In a computer or personal computer, the PCS processor and the AED processor are the central processing unit (CPU) 51 of the computer. The CPU 51, resident on the motherboard, interfaces with a number of input/output devices including a microphone 52, speaker 53, display 54,
30 input 55 and memory (both RAM and ROM) 56 modules across a data bus 57. The

computer 50 may also include a wireline telephone network interface 58. The CPU 51 is a shared resource with other computer functions.

In order to operate the computer within the PCS, the computer is provided with appropriate PCS software within the memory module 56 enabling operation of the PCC within the computer 50. In the event that the PCS is established on the basis of a PCMCIA format, any computer having a PCMCIA slot and the appropriate application software could operate the PCS.

As a typical computer does not include an antenna module, operation of the computer within the PCS would typically require a PCC antenna module configured to the PCC.

As indicated, the CPU of the computer is a shared resource. Accordingly, the computer may also be running such applications including word processors, spreadsheets and games. Thus, during operation of the PCS, the CPU activates the PCS functions while other computer functions remain active in the background.

In a further embodiment of the PCS, it is envisaged that the PCC communicate with the computer via an infra-red communication link. In this embodiment, both the computer and the PCC are provided with respective infra-red transmitter/receiver means enabling data communication between the two entities. Accordingly, this embodiment of the invention contemplates a wireless link between the PCC and computer.

Portable phone body

Figure 3 shows a portable phone 60 in accordance with the PCS. Essentially, the body of a portable phone 69 is provided with an interface 68 for connecting a PCC 14. The body of the portable phone typically includes a PCS processor 61 along with power 62, microphone 63, speaker 64, display 65, and input 66 modules as well as an antenna module 67.

Accordingly, a user may connect the PCC 14 to the portable phone body 69 to activate the portable phone 60. The design of the portable phone body allows for the PCC to interface with the body through a common interface, such as PCMCIA.

- 5 In another embodiment, the portable phone body may also include auxiliary connectors to provide direct analog microphone and speaker access to the PCC.

The portable phone body 69 may also include a wireline telephone interface 70 enabling connection of the portable phone 60 to a wireline telephone network.

10

Operation of a Portable Phone Body with a Docked PCC

- The portable phone is unique among the AEDs as it is the only AED which may have no functionality without the PCC as it may only provide a low cost interface between the PCC and the user. The portable phone body has the appearance of a mobile
15 cellular phone consisting of a speaker, alert LED, LCD, keypad, microphone, and battery pack. When the PCC is docked and the PCC is fully powered the portable phone body becomes functional. Alternatively, embodiments are contemplated where the portable phone body would include primary functionality such as a personal data assistant.

20

A) Incoming Voice Call

- With the PCC docked in the portable phone body and fully communicating, the PCC is prepared to accept incoming voice calls. The PCC will detect the incoming call and send an message to the portable phone body. The portable phone body will connect
25 the audio paths between the PCC and the alert speaker—allowing the user to hear ring tone. At the same time, the portable phone body will display the pertinent display information. The keypad will become functional and pressing the Send key will connect the microphone , speaker audio paths, and the phone call. Alternately, voice recognition commands may be utilized instead of, or in conjunction with, all key press
30 actions.

B) Out Bound Voice Call

With the PCC docked in the portable phone body and fully communicating, the PCC is able to make out bound voice calls. Pressing any key on the portable phone body brings the PCC and the portable phone body into an active state from a low power consumption state which may be provided whenever it is inactive for a prolonged period of time. In the active state, the wireless communication keypad functions and display functions become operational and the phone number can be input. Pressing the Send button connects the audio paths between the PCC and the speaker and microphone, the user will hear the ring tone. Again, voice recognition commands may be utilized instead of, or in conjunction with, all key press actions.

C) Terminating Incoming or Out Bound Voice Calls

When either an incoming or out bound voice call has been commenced it must be terminated by the user. To terminate either type of call the End key is pressed. This sends a command to the PCC to terminate the call. The portable phone body disconnects the audio path entirely. The portable phone body resumes the mode of operation it was in prior to the incoming or out bound call. Again, voice recognition commands may be utilized instead of, or in conjunction with, all key press actions.

D) Data Calls

Depending on the specific functionality of the PCC placed into the portable phone body, data calls may or may not be possible and may or may not require the user to utilize a manual or automatic mode to send or receive data. Some PCC's will be able to automatically detect the that an incoming or outbound call is either data or voice while other PCC's are not. In the event that the PCC is unable to detect the difference between voice and data calls the switching between the two modes is accomplished by the user. Initiating data mode on the portable phone body keypad results in the appropriate display and turns on the PCC modem. With the data mode turned on, sending and ending a wireless data communication is identical to the procedure followed for a voice call.

Car Radios/Home Stereo/Portable Radios

Figure 4 shows a block diagram of a car radio, home stereo or portable radio in accordance with the PCS. In order to use these systems in accordance with the PCS, such systems may be designed to include the appropriate PCS modules.

5

In the case of a car radio system, such systems are either factory installed or custom installed within a vehicle. Typically, the state-of-the-art provides digital processors providing numerous features and variations in design such as removable face plates in addition to other security systems. Existing car radios include an RF
10 receiver/processor 80, power 81, speaker 82, display 83 and antenna 84 modules to provide the basic car radio functionality. Accordingly, in order to operate a car radio in accordance with the PCS, a PCS processor 89, microphone module 85, enhanced input module 86 and PCS interface 87 would be introduced into the car radio structure 90. Still further, an auxiliary headset and microphone system 88 or other hands-free
15 system with an appropriate interface to the PCS processor 80 may be provided to facilitate hands-free operation of the PCS within a vehicle.

Similar modifications may be made to a home stereo or portable radio wherein these devices are provided with a PCS processor, interface and appropriate input and/or
20 microphone modules, if necessary.

Still further, a car radio may be provided specifically with a computer interface 91 to enable direct connection of a computer 92 to the car radio 90 to enable fax communication through the AED in the event that the PCC 14 has a modem means.

25

In a further embodiment of the radio embodiment wherein an IR link is utilized between the PCC and AED, it is contemplated that a user with a cell phone body with a PCC could place the cell phone body in a bracket facing the radio IR transceiver in order to provide hands-free operation of the cell phone adjacent the radio. In this
30 embodiment, upon placing the cell phone body in the appropriate bracket or holder, the PCC would communicate with the radio, utilizing the speaker and microphone

modules of the radio while inactivating the speaker and microphone modules of the cell phone body.

Operation of Radio with a Docked PCC having a Cellular Transceiver and/or data modem

5

With a PCC docked with the radio, the functionality of the radio is increased to enable wireless communication through the radio and in particular, the functionality is increased to enable voice and/or data reception and transmission.

10 Generally, however, the interior of an automobile, for example, is a hostile environment for wireless full-duplex voice communications. This problem can be solved by passing incoming/outgoing audio through an echo cancellation DSP (digital signal processor) to negate the echoes created within passenger cavity of the automobile and may be a component of the radio.

15

A) Incoming Voice Call

With the PCC docked with the radio and communicating with the radio, the PCC is prepared to accept incoming voice calls. Since the PCC increases the functionality of the radio, the user may be listening to the radio when an incoming voice call is initiated. The PCC will detect the incoming call and send an interrupt message to the radio. The radio will disconnect the audio paths away from the CD, tape player, AM, or FM radio station as may be operative, to the PCC. With the audio paths open to the radio's speakers, the user will hear ring tone. At the same time the radio will change the display over to a "PCC Mode" and pertinent information will be displayed.

25 Keypad functionality will also change over to "PCC Mode" activating the wireless communication keys. Pressing the Send key will both connect the microphone audio path and thus, the phone call. Alternately, other input means such as voice recognition commands may be utilized instead of, or in conjunction with, all key press actions.

30

B) Out Bound Voice Call

With the PCC docked in the radio and communicating with the radio, the PCC is prepared to make out bound voice calls. Since the PCC increases the functionality of the radio, the user may be listening to the radio when he/she decides to initiate an out bound voice call. To change from listening to the radio, to placing an out bound voice call an appropriate PCC mode button is pressed. At this time the wireless communication keypad functions and display functions become operational and the phone number can be input. Pressing the Send button disconnects the audio paths away from a CD, tape player, AM, or FM radio station as may be operative, to the PCC. With the audio paths open to the radio's speakers and microphone the user will hear the ring tone. Again, other input means such as voice recognition commands may be utilized instead of, or in conjunction with, all key press actions.

C) Terminating Incoming or Out Bound Voice Calls

When either an incoming or out bound voice call has been commenced it must be terminated by the user. To terminate either type of call the End key is pressed. This sends a command to the PCC to terminate the call. The radio switches the output audio path back to the radio speakers and disconnects the PCC input audio path entirely. The radio resumes the mode of operation it was in prior to the incoming or out bound call. Again, voice recognition commands may be utilized instead of, or in conjunction with, all key press actions.

D) Data Calls

Depending on the specific functionality of the PCC placed in the radio, data calls may or may not be possible and may or may not require the user to utilize a manual or automatic mode to send or receive data. Some PCCs will be able to automatically detect that an incoming or outbound call is either data or voice while other PCCs will not. In the event that the PCC is unable to detect the difference between voice and data calls, switching between the two modes is accomplished by the user. Initiating data mode on the radio keypad results in the appropriate display on the radio and turns on the PCC modem. With the data mode turned on, sending and ending a wireless data communication is identical to the procedure followed for a voice call.

Portable Radio, Compact Disk or Cassette Player

Figure 5 is a block diagram showing a portable compact disk or cassette player in accordance with the PCS. Typically, existing portable radios, compact disk or cassette
5 players do not include microphone, enhanced display, enhanced keypad or antenna modules (in portable compact disk or cassette players) but do include both a power module and speaker system through a headset 99. Accordingly, in order to use portable compact disk or cassette player in accordance with the PCS, such a device is modified to include a PCS processor 100 and interface 101, enhanced display 102,
10 enhanced input 103, microphone 104 and antenna 105 modules.

Preferably, the portable radio, compact disk or cassette player would be provided with a modified headset system in which, in addition to the speaker ear pieces, the headset includes a microphone and antenna (99, 104, 105).

15

In another embodiment, the portable radio, compact disk or cassette player may also include auxiliary connectors to provide direct analog microphone and speaker access to the PCC.

20 A portable radio, compact disk or cassette player may also be provided with a cable network interface 106 and/or wireline telephone network interface 107.

Televisions

Figure 6 is a block diagram showing a television in accordance with the PCS.

25 Typically, existing televisions do not include microphone or interface modules but do include power 110, speaker 111, screen 112 and antenna 113 modules. In addition, televisions include remote control units 114 which communicate with the television 115 via an infra red link. Accordingly, in order to use a television 115, in accordance with the PCS, a television 115 is modified to include a PCS processor 116 and
30 interface 117 and an appropriate microphone module 118.

In using a television in accordance with the invention, the television's remote unit 114 is used to interface the user's commands with the PCS.

Still further, the PCS may support a cellular/air interface over a cable television network via a cable network interface 119 or a wireline telephone network interface over a wireline telephone network via a wireline telephone network interface 120.

Video Cameras

Figure 7 is a block diagram showing a video camera in accordance with the PCS. Typically, existing video cameras do not include enhanced keypad or antenna modules but do include power 130, microphone 131, speaker 132 and display 133 modules. Accordingly, in order to use a video camera in accordance with the PCS, a typical video camera is modified to include a PCS processor 134 and interface 135, enhanced keypad 136 and antenna 137 modules.

15

Still further, the video camera may be provided with a wireline telephone network interface 139 for establishing wireline telephone network connection.

In a still further embodiment of the PCS, a video camera may also be provided with a video interface 138 to enable connection of the video camera to a video network for establishing video conferencing across a video network.

Depending on the functionality of the PCC placed into the Video Camera, video data calls may or may not be possible and may or may not require the user to utilize a manual or automatic mode to send or receive data. Some PCC's would be able to automatically detect the that an incoming or outbound call is either video data or voice while other PCCs will not. In the event that the PCC is unable to detect the difference between voice and video data calls, switching between the two modes would be accomplished by the user. Initiating video data mode on the Video Camera keypad would result in the appropriate display on the Video Camera and would turn on the

30

modem in the PCC. With the video data mode turned on, sending and ending a wireless data communication is identical to the procedure followed for a voice call.

Some versions of the PCCs will have video compression as a component of the air
5 protocol while others do not. In cases where video compression is not part of the air protocol, the compression algorithm and processing will be performed by the DSP on the AED side of the communication bus. This solves the problem of addressing video compression with PCCs of differing technology identifiers.

10 *Messaging Devices*

Figure 8 is a block diagram showing a one-way messaging device 140 in accordance with the PCS. A one-way messaging device typically receives and displays messages and allows the user to scroll or clear messages. In accordance with the PCS, a one-way messaging device is provided with a PCS processor 141, power module 142,
15 speaker module 143, display module 144, antenna module 145, input module and interface module 146 within the body of the messaging device 140.

Figure 9 is a block diagram showing a two-way messaging device in accordance with the PCS. A two-way messaging device typically receives, displays, composes and
20 sends messages. In accordance with the PCS, the two-way messaging device 150 is provided with a PCS processor 151, power module 152, microphone module 153, speaker module 154, display module 155, input module 156, antenna module 157 and interface module 158 within the body of the messaging device 150.

25 *Payphone/Home Phone System*

Figure 10 is a block diagram showing a payphone/home phone system in accordance with the PCS. A typical payphone/home phone 160 includes a phone processor 161 and microphone 162, speaker 163, display 164 and input 165 modules enabling operation of the payphone over a wireline telephone network via a wireline telephone
30 network interface 164a. Accordingly, in order to operate a payphone/home phone 160

in accordance with the PCS, the phone is provided with a PCS processor 166 and interface module 167.

5 In a further embodiment of the home phone system, a home phone is often a wireless phone system in which a handset communicates with a base station via an RF link. In this regard, it is specifically envisaged that the PCC may interface directly with the handset so that the handset may be used either independently as a cellular phone if outside the range of the base station or over the wireline networks if within range. Alternatively, the PC may interface directly with the base station providing cell phone
10 or wireline communication within the PCS from the base station only.

Call Forwarding

In one embodiment, the placement of the PCC in the home phone prompts PCS processor of the home phone (or other AED) to place a landline call to the PCS
15 service provider to have all wireless communication calls transferred to the home phone (or other AED). When the PCC is docked in the home phone, the PCC, in addition to sending its technology identifier also sends its service provider's phone number and call forwarding commands. This solves the problem of having to program each home phone to accept every PCC. Once the home phone has
20 successfully transmitted the call forwarding information power to the PCC is terminated.

Fax machines

Figure 11 is a block diagram showing a fax machine in accordance with the PCS. A
25 typical fax machine 180 includes a fax processor 181 and microphone 182, speaker 183, display 184 and input 184a modules enabling operation of the fax machine over a wireline telephone network via a wireline telephone network interface 185. Accordingly, in order to operate a fax machine 180 in accordance with the PCS, the fax machine is provided with a PCS processor 186 and interface module 187.

30

Answering machines

Figure 12 is a block diagram showing an answering machine in accordance with the PCS. A typical answering machine 190 includes an answering machine processor 191 and microphone 192, speaker 193, display 194 and input 194a modules enabling operation of the answering machine while connected to a wireline telephone network via a wireline telephone network interface 195. Accordingly, in order to operate an answering machine 190 in accordance with the PCS, the answering machine is provided with a PCS processor 196 and interface module 197.

Data Terminal

In accordance with other embodiments of the PCS, the PCC may also include a modem for data communication across a cellular network. In this form, the PCS may be used, for example, as an Internet data terminal or point-to-point data terminal, if the PCS processor and display module can support this function. In this application, various functionality may be provided within the PCS processor. Generally, the microphone module is not required for data connection and the speaker module is used to relay the modem connection signals to the user as a call setup process indication. The PCS processor may enable the user to setup the system so as to not answer any incoming calls on the PCC. In establishing a data connection, the user commands the system via the remote control to make the connection via the PCC as a cellular modem. The PCS processor commands the PCC to establish a modem connection with a remote data unit or an Internet Service Provider (ISP) by dialling the appropriate number and attempting to establish a data link. Once the modem link is established, the PCS processor will inform the user via the screen module of the establishment of the link and enables the user to enter commands from the remote control to direct the session.

Network Connections

Figure 13 is a block diagram of network connections in accordance with one embodiment of the PCS. An AED 12 may include a cable network interface 200, an AED antenna interface 202, and wireline telephone network interface 204 as well as microphone 206 and speaker 208 modules. In order to enhance the operability and

flexibility of the PCS, an auxiliary interface 210 may be provided to enable direct connection of the AED cable network interface, AED antenna interface 202, microphone 206 or speaker 208 modules to the PCC 14.

5 Specifically, the cable network interface 200 is provided with a splitter 200a for splitting the cable network function between AED cable function 200b and the PCC 14. For PCS cable network connection, a PCS bandpass filter 200c may be provided between the splitter 200a and the auxiliary interface 210. Similarly, the antenna
10 interface 202 is also provided with a splitter 202a for splitting the antenna function between the AED antenna function 202b and the PCC 14. A PCS bandpass filter 202c may also be provided. Within the PCC 14, the radio module 40 (when a transceiver) decides which antenna function to use, that is either the cable network 200, AED antenna 202 or PCC antenna 42 through transceiver switch 40a. Accordingly, the transceiver module 40 determines the most appropriate communication function.

15 As a further component of the auxiliary interface 210 and PCS processor 30, microphone switch 206a and speaker switch 40 may be provided to enable direct microphone and/or speaker connection to the PCC 14 through the auxiliary interface 210 or to enable AED microphone function 206b or AED speaker function 208b when
20 the primary AED function is required. In this embodiment, the PCC includes analog/digital converter 206c and/or digital/analog converter 208c within the PCC 14, as required.

Security

25 Within the PCS, it is preferable that security is implemented to minimize or eliminate unauthorized use of the PCS. Within the PCS, the user will normally carry the PCC either alone (in between particular AED's) or along with a particular AED. Due to the size and portability of the PCC, the potential for loss of the PCC by a user requires the development of a security system to minimize the potential for loss by the user and
30 service provider.

With cellular telephones, the potential liability from unauthorized use may be significant in terms of cost. With increasing sophistication or authentication procedures in wireless communication systems, the loss may be limited once the service provider has been informed of the loss. However, in that the interval from loss
5 of the device to interruption of service may be several hours to several days, significant loss to either the user or service provider may be incurred in addition to inconvenience to the customer to clarify billing charges with the provider. Accordingly, in order to protect both parties, security is preferably implemented to minimize the potential for loss through user-specified passwords.

10

Such passwords, encrypted and stored in non-volatile memory within the PCC, the PCS would require entry of the password to enter the second stand-by mode. Failure to enter the correct password within a specified time period or after a specific number of tries would disable the PCC until reactivated by a certified service centre or a
15 sufficiently long time has elapsed between failed attempts. While such security systems may not provide absolute security, in the majority of situations, unauthorized access would be sufficiently delayed until the PCC was reported lost and deactivated by the service provider. Service could be resumed with the same dialling number by issuing a new PCC with a new authentication code to the user.

20

Furthermore, a PCC could be allowed to place emergency calls to an operator, assisted calling, or 911 service without a password.

It is further understood that additional forms implementing a security system may be
25 implemented in accordance with the PCS.

Fax Communication

In a further embodiment of the PCS, the system contemplates a combination voice mail/fax mail system in which a user is provided with both a voice number and fax
30 number. In this embodiment, the user may interface the PCC with an AED as described above. In the event that an incoming call is received on the voice number,

the AED would ring signalling an incoming voice call and the call may be answered as generally described above. Alternatively, in the event that an incoming call is received on the fax number, the AED processor determines whether the AED is capable of receiving a fax. Thus, in the event that the AED is a fax machine or a computer having the appropriate hardware/software for receiving a fax, the AED would signal that a fax is incoming (through a different ring signal to the voice ring signal) and the fax would be received directly through the AED. Alternatively, in the event that the AED is not capable of receiving a fax, the AED would signal that the AED cannot receive a fax and the fax would be directed to a fax mail system resident with the service provider.

The signal to determine whether the AED can receive a fax or not would preferably be established during activation of a particular AED. Thus, at the time a user places a PCC within an AED and normal cell phone roaming procedures are initiated to establish the presence of an activated AED, information relevant to the AED's capability of receiving a fax would be transmitted to the service provider, thus determining whether an incoming fax will be routed to the AED or fax mail system.

In the event that a fax is routed to the fax mail system, the user may inquire as to the presence of any fax mail through access to a voice/fax system in accordance with standard cellular system access numbers and codes. Once access to the voice/fax mail system is achieved, menu prompts would notify the user of existence of either voice or fax mail documents. Release of voice mail is achieved in accordance with standard voice mail systems. Release of fax mail documents is achieved by instruction to release the fax mail document to a specific fax number, for example, either the user's specific fax number or to another user specified number. Accordingly, in the event that the user has accessed the voice/fax mail request from a fax AED such as a fax machine or computer, fax transmission to the user's fax number could be selected to initiate fax transmission as soon as the user exits the voice/fax mail system.

Alternatively, if the user has accessed the voice/fax mail from a non-fax AED, the

user may specify that the fax is returned to the voice/fax mail memory or released to a specific fax number which may be entered by the user.

In still further embodiments of the AED's in accordance with the PCS, each AED may
5 be provided with a computer interface to enable fax communication from a personal computer through the AED and within the PCS.

Global Positioning System

In a still further embodiment of the PCS, an AED may be provided with
10 communication interfaces enabling both GPS receiver capabilities and cellular transceiver capabilities through the AED. GPS receiver capabilities may be individual or combined with cellular capabilities or other radio receiver means intended for differential GPS (DGPS) use.

15 In one embodiment, a GPS PCC is provided to enable an AED to display GPS information. In particular, it is contemplated that the GPS PCC would be used in conjunction with AED's such as a portable phone body, portable radio, personal cassette or CD player, video camera or car radio.

20 In a further embodiment, each of the above AED's may also be provided with the dual functionality of GPS and cellular. In particular, an embodiment of the PCS is contemplated wherein the AED processor will receive GPS positioning data and report that information over the cell network to a specific GPS/cellular service provider either automatically on a time basis or alternatively at the specific request of
25 the user. In particular, this embodiment is contemplated for use as a security system for individuals or as a business monitoring tool to report the position of employees in a company.

If the AED contemplates a user's security, the AED may be provided with an
30 emergency position reporting button to immediately report the individual's position.

The terms and expressions which have been employed in this specification are used as terms of description and not of limitations, and there is no intention in the use of such terms and expressions to exclude any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within

5 the scope of the claims.

WHAT IS CLAIMED IS:

1. A personal communications system (PCS) for enhancing the communications capabilities through a plurality of different audio equipment devices (AED) having a primary functionality, the communications system comprising:

a portable communications card (PCC), the portable communications card including:

radio communications means, the radio communications means including any one of or a combination of radio receiver or radio transceiver means;

PCC processor means operatively connected to the radio communications means and a communication card interface, the PCC processor means for establishing operative communication between the radio communications means and an audio equipment device through the communication card interface; and

wherein the audio equipment device (AED) has power, speaker, input and display means operatively connected to a PCS processor and AED interface means, the AED interface means adapted for operative connection to the communication card interface wherein the PCS processor includes means for over-riding the primary functionality of the AED and means for controlling radio communication through the AED when the PCC is connected to the AED through the AED interface means and communication card interface.

2. A personal communication system as in claim 1 wherein the radio communication means is selected from any one of or a combination of radio frequency (RF) telephone transceiver means, AM receiving means, FM receiving means, MB receiving means, SW receiving means, PM receiving means, CB transceiver means, video receiving means, satellite receiving means, and GPS receiving means.

3. A personal communication system as in any one of claims 1 or 2 wherein the AED is adapted to communicate with two or more PCC's.

4. A personal communication system as in any one of claims 1-3 wherein the means for controlling radio communication includes means for controlling wireline telephone communication through the wireline telephone network and the AED includes wireline telephone network interface means operatively connected to the PCS processor.

5. A personal communication system as in any one of claims 1-4 wherein the means for controlling radio communication includes means for controlling cable telephone communication through the cable network and the AED includes cable network interface means operatively connected to the PCS processor.

6. A personal communication system as in any one of claims 1-5 wherein the PCC processor means includes non-volatile memory means for storing user specific information.

7. A portable communications card (PCC) for providing radio communication capabilities to a plurality of different audio equipment devices (AED) having a primary functionality, the PCC comprising:

radio communications means, the radio communications means including any one of or a combination of radio receiver or radio transceiver means;

PCC processor means operatively connected to the radio communications means and a communication card interface, the PCC processor means for establishing operative communication between the radio communications means and an audio equipment device through the communication card interface.

8. A portable communications card as in claim 7 wherein the radio communication means is selected from any one of or a combination of radio frequency (RF) telephone transceiver means, AM receiving means, FM receiving means, MB receiving means, SW receiving means, PM receiving means, CB transceiver means, video receiving means, satellite receiving means, and GPS receiving means.

9. A portable communications card as in any one of claims 7-8 further comprising PCC antenna means adapted for operative connection to the PCC for providing antenna function to the PCC and associated AED.

10. A portable communications card as in any one of claims 7-9 wherein the communication card interface is an infrared interface.

11. A portable communications card as in any one of claims 4-7 wherein the PCC includes modem means operatively connected to the PCC processor.

12. An audio equipment device (AED) for use within a personal communications system (PCS), the AED having a primary functionality and adapted for operative connection to a portable communication card (PCC) to enable radio communication through the AED, the AED having power, speaker, input and display means operatively connected to a PCS processor and AED interface means, the AED interface means adapted for operative connection to the PCC wherein the PCS processor includes means for over-riding the primary functionality of the AED and means for controlling radio communication through the AED when the PCC is communicating with the AED.

13. An AED as in claim 12 wherein the PCS processor includes echo cancellation means.

14. An AED as in any one of claims 12-13 wherein the AED interface communicates with the PCC by an infrared link.

15. An AED as in any one claims 12-14 wherein the PCS processor includes means for controlling wireline telephone communication through the AED and wireline telephone interface means for connecting the AED to a wireline telephone system.

16. An AED as in any one claims 12-15 wherein the PCS processor includes means for controlling cable telephone communication through the AED and cable network interface means for connecting the AED to a cable telephone system.

17. An AED as in any one of claims 12-16 wherein the AED further comprises an auxiliary headset means containing auxiliary speaker and auxiliary microphone means, the auxiliary headset adapted for operative connection to the PCS processor.

18. An AED as in any one of claims 12-17 wherein the input means is selected from any one of or a combination of keypad means, voice recognition system (VRS), mouse input device, pen input device, trackball input device, touch pad, touch screen, force pad or force stick.

19. An AED as in any one of claims 12-18 wherein the display means is selected from any one of or a combination of liquid crystal display (LCD), light emitting diode (LED), cathode ray tube (CRT), electroluminescent panel (EL) or fluorescent indicator panel (FIP)

20. An AED as in any one of claims 12-19 wherein the interface standard is PCMCIA.

21. An AED as in any one of claims 12-20 wherein the AED is a personal computer including a central processing unit (CPU), microphone, speaker, display, input, AED interface means and computer memory means and wherein the means for controlling radio communication is PCS program means within the computer memory means.

22. An AED as in any one of claims 12-20 wherein the AED comprises a portable phone body, the portable phone body including a PCS processor, microphone means,

speaker means, display means, input means, antenna means and AED interface means.

23. An AED as in any one of claims 12-20 wherein the AED is a car radio having a car radio body, the car radio further comprising a PCS processor, microphone means, display means, input means and AED interface means within the car radio body, the PCS processor operatively connected to speaker means and antenna means.

24. An AED as in claim 23 wherein the car radio includes a computer interface operatively connected to the PCS processor for interfacing a personal computer to the car radio and the PCC includes modem means for enabling fax communication through the PCS.

25. An AED as in any one of claims 12-20 wherein the AED is a portable compact disk player comprising:

portable compact disk player body including compact disk playing means, power means, display means, input means, speaker means, microphone means and AED interface means operatively connected to a PCS processor.

26. An AED as in any one of claims 12-20 wherein the AED is a portable cassette player comprising:

portable cassette player body including cassette playing means, power means display means, input means, speaker means, microphone means and AED interface means operatively connected to a PCS processor.

27. An AED as in any one of claims 12-20 wherein the AED is a portable radio comprising:

portable radio body including radio receiver means, power means display means, input means, speaker means, microphone means and AED interface means operatively connected to a PCS processor.

28. An AED as in any one of claims 12-20 wherein the AED is a television, the television comprising:

television body including television receiver and television display means; input means, speaker means, microphone means and AED interface means operatively connected to a PCS processor within the television body.

29. An AED as in claim 28 wherein the input means is a television remote control.

30. An AED as in any one of claims 12-20 wherein the AED is a video camera, the video camera comprising:

video camera body including video camera means; input means, speaker means, microphone means and AED interface means operatively connected to a PCS processor within the video camera body.

31. An AED as in claim 31 further comprising video image display means and cable network interface means on the video camera body, the video image display means and cable network interface means operatively connected to the PCS processor through the video camera body and wherein the PCS processor includes means for sending video camera imaging over a cable network and means for receiving video camera imaging over a cable network for display on the video image display means.

32. An AED as in any one of claims 12-20 wherein the AED is a one-way messaging device, the one-way messaging device including:

messaging device body including a PCS processor operatively connected to power means, speaker means, display means, antenna means and AED interface means within the messaging device body.

33. An AED as in any one of claims 12-20 wherein the AED is a two-way messaging device, the two-way messaging device including:

messaging device body including a PCS processor operatively connected to power means, microphone means, speaker means, display means, input means, antenna means and AED interface means within the messaging device body.

34. An AED as in any one of claims 12-20 wherein the AED is a phone having a phone body, a hand set including microphone and speaker means operatively connected to a phone processor, the phone further comprising a PCS processor within the phone body and AED interface means on the phone body.

35. An AED as in any one of claims 12-20 wherein the AED is a fax machine, the fax machine including:

fax machine body and fax machine processor including a PCS processor operatively connected to the fax machine processor, power means, microphone means, speaker means, display means, input means, and AED interface means within the fax machine body.

36. An AED as in any one of claims 12-20 wherein the AED is an answering machine, the answering machine including:

answering machine body and answering machine processor including a PCS processor operatively connected to the answering machine processor, power means, microphone means, speaker means, display means, input means, and AED interface means within the answering machine body.

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PERSONAL COMMUNICATION SYSTEM

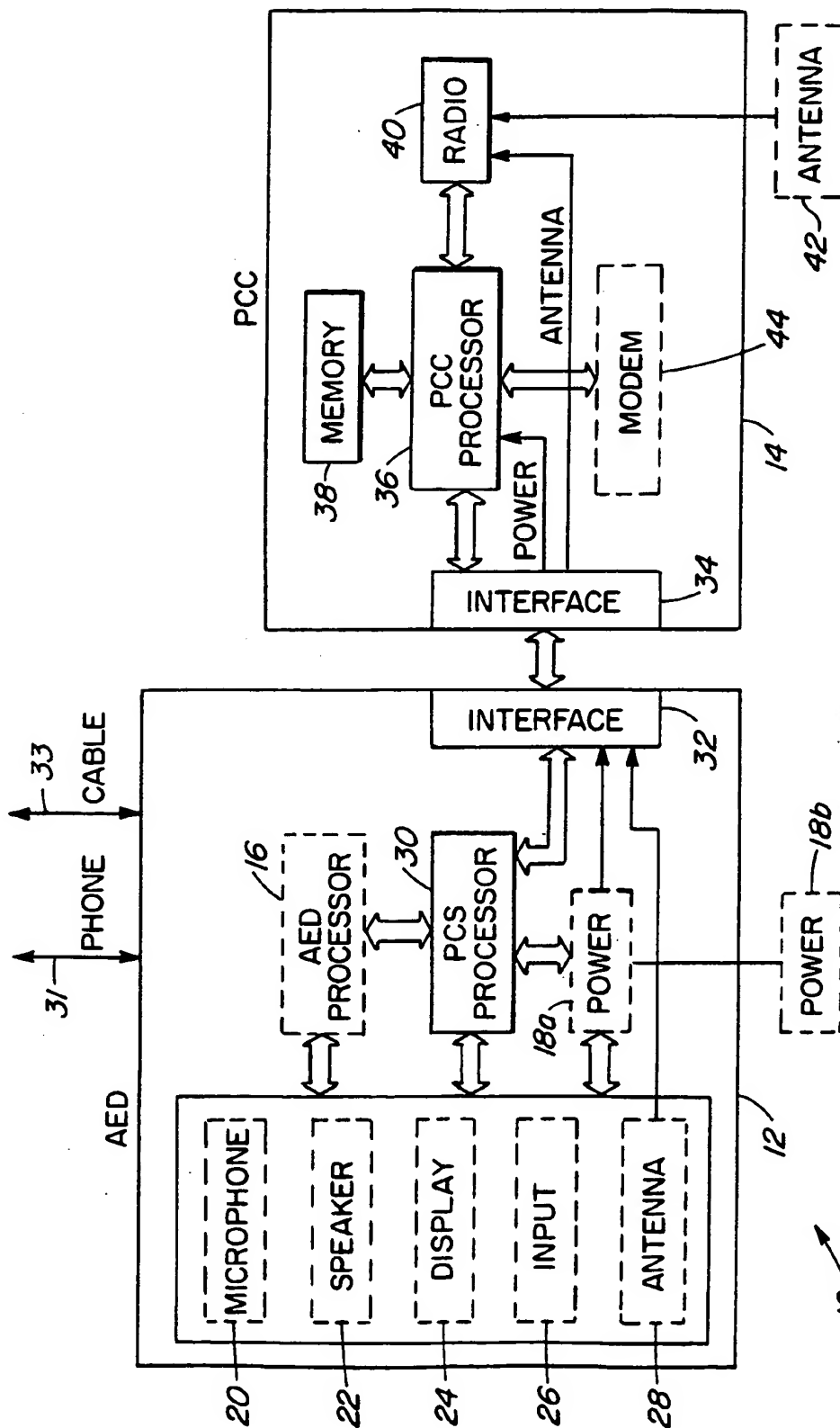


FIG. 1

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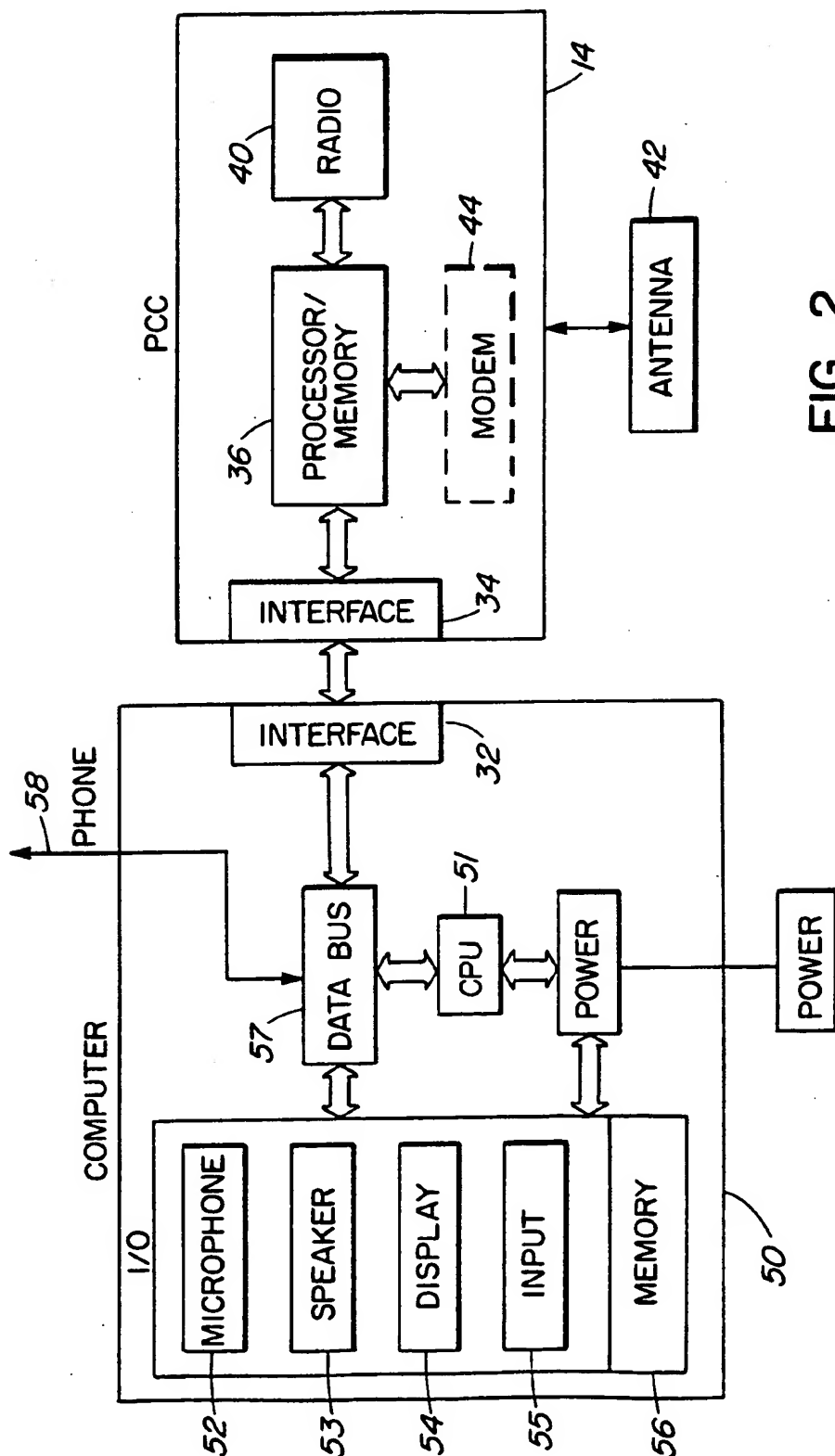


FIG. 2

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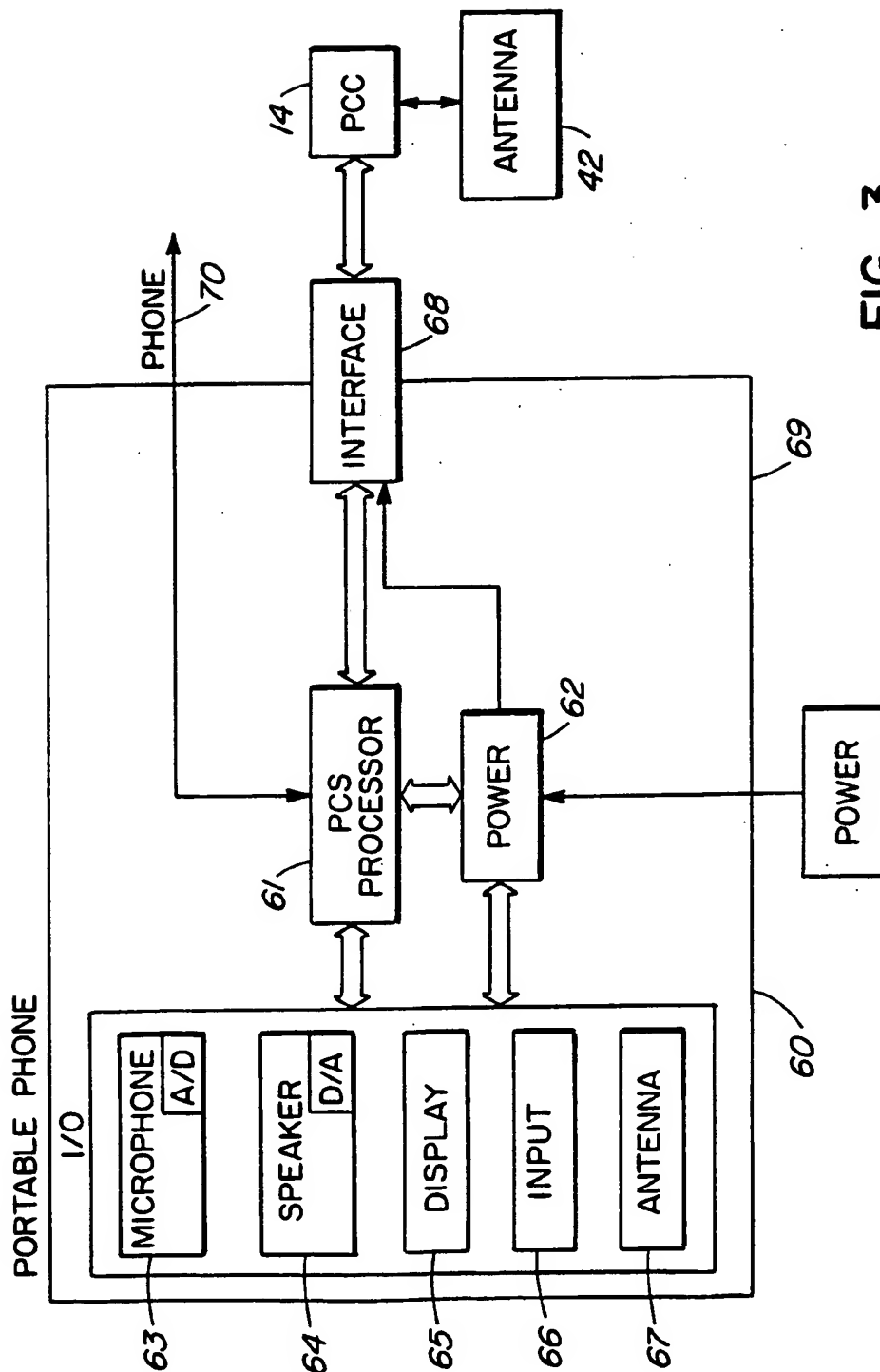


FIG. 3

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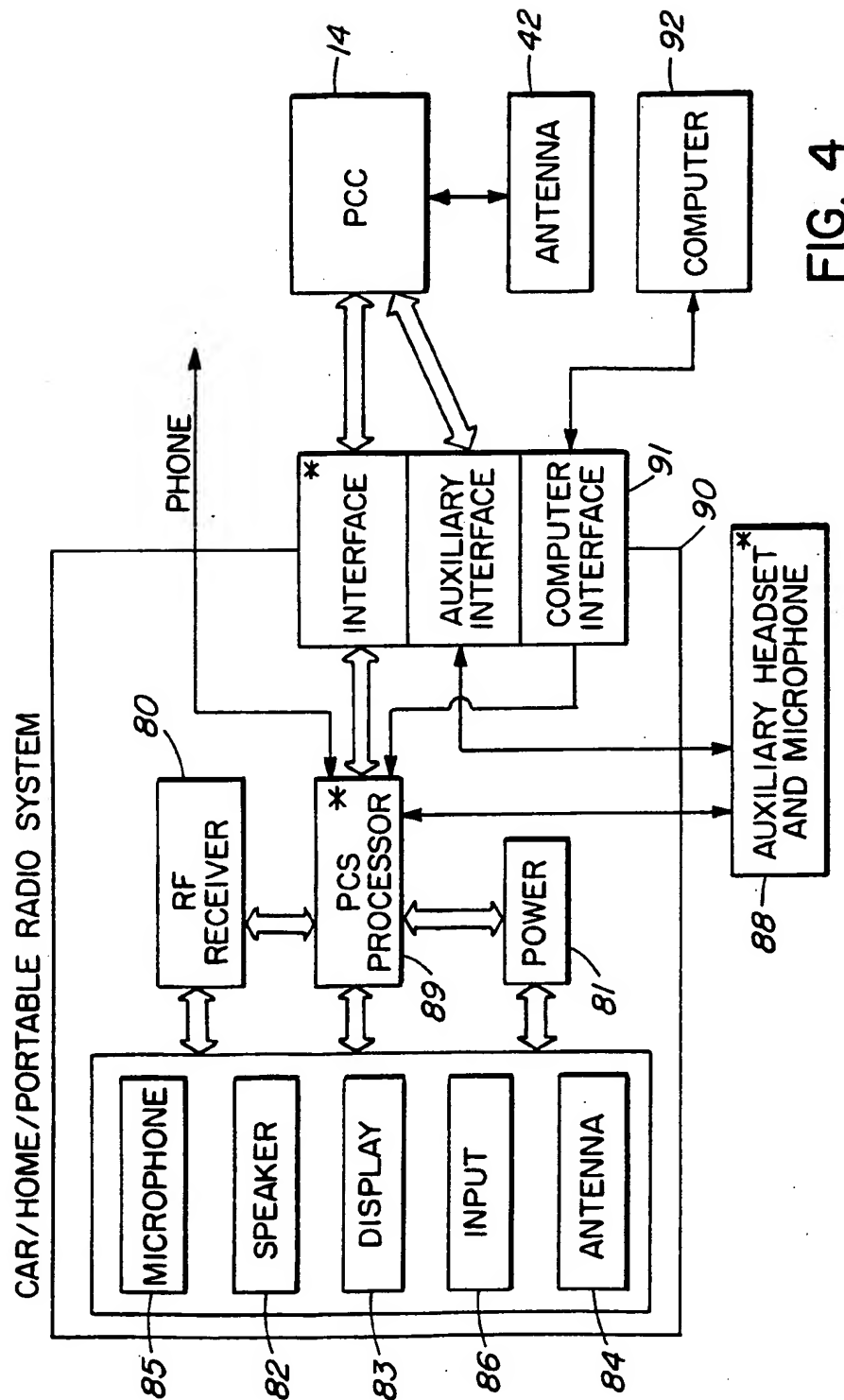


FIG. 4

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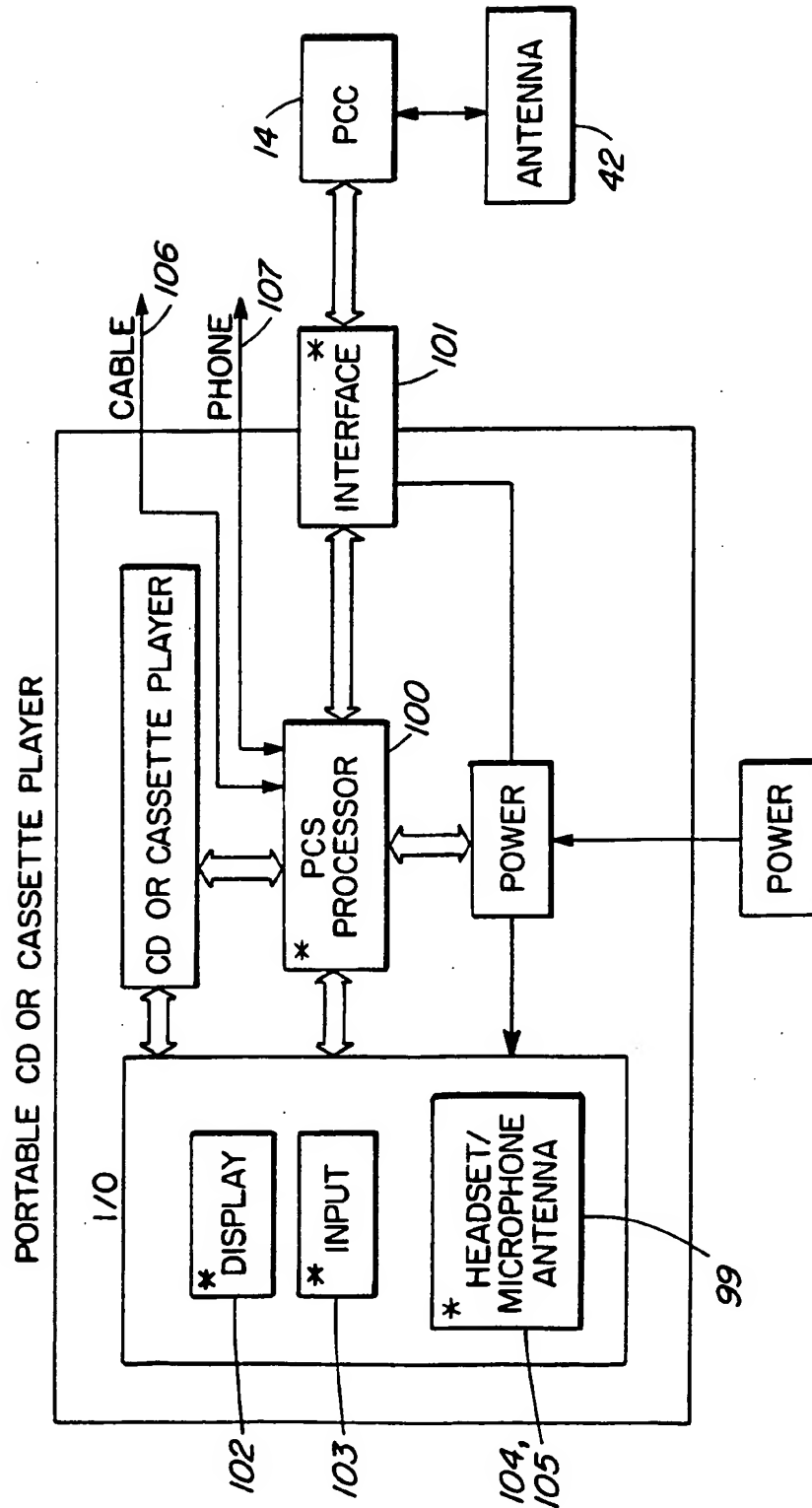


FIG. 5

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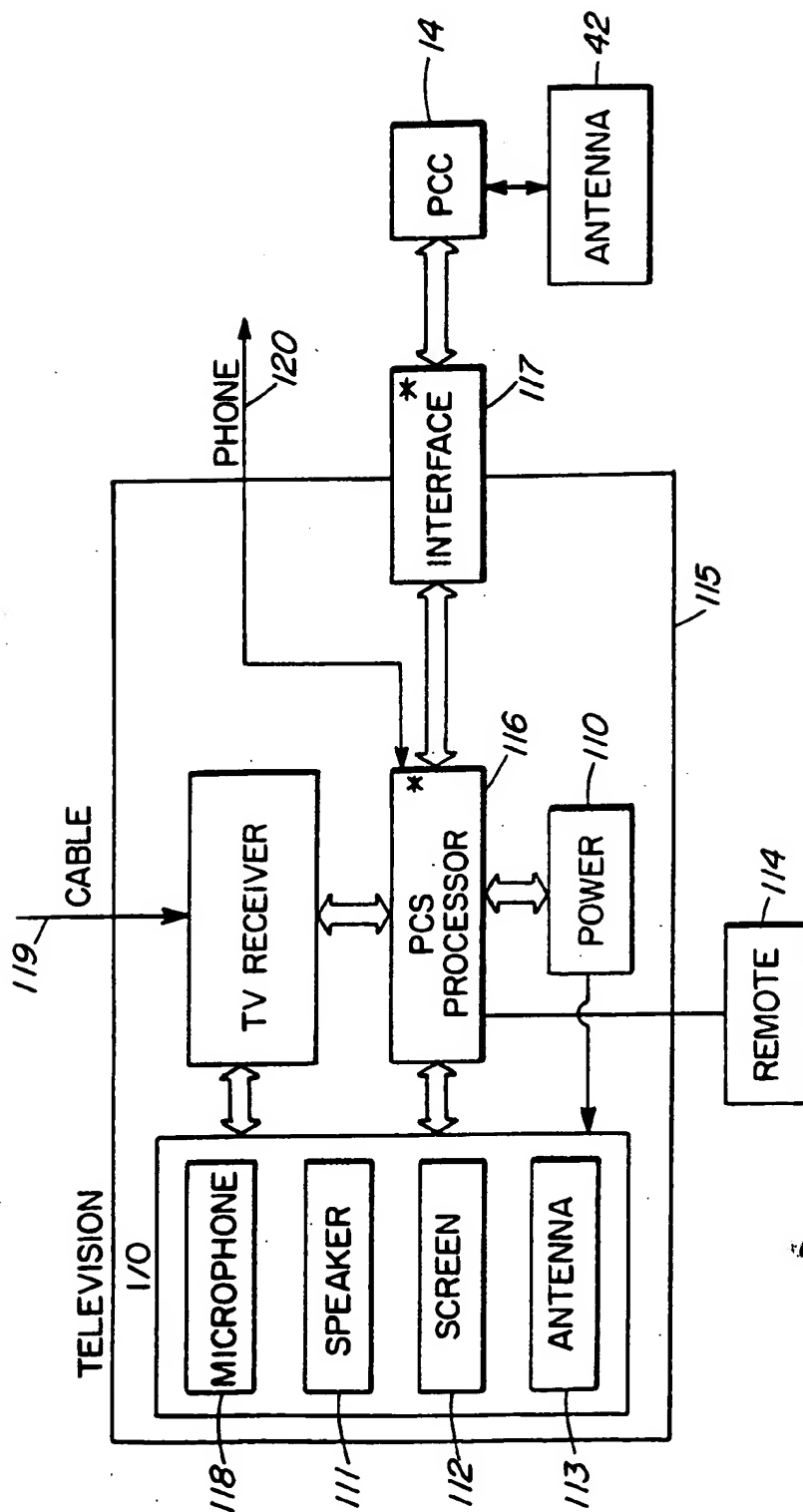


FIG. 6

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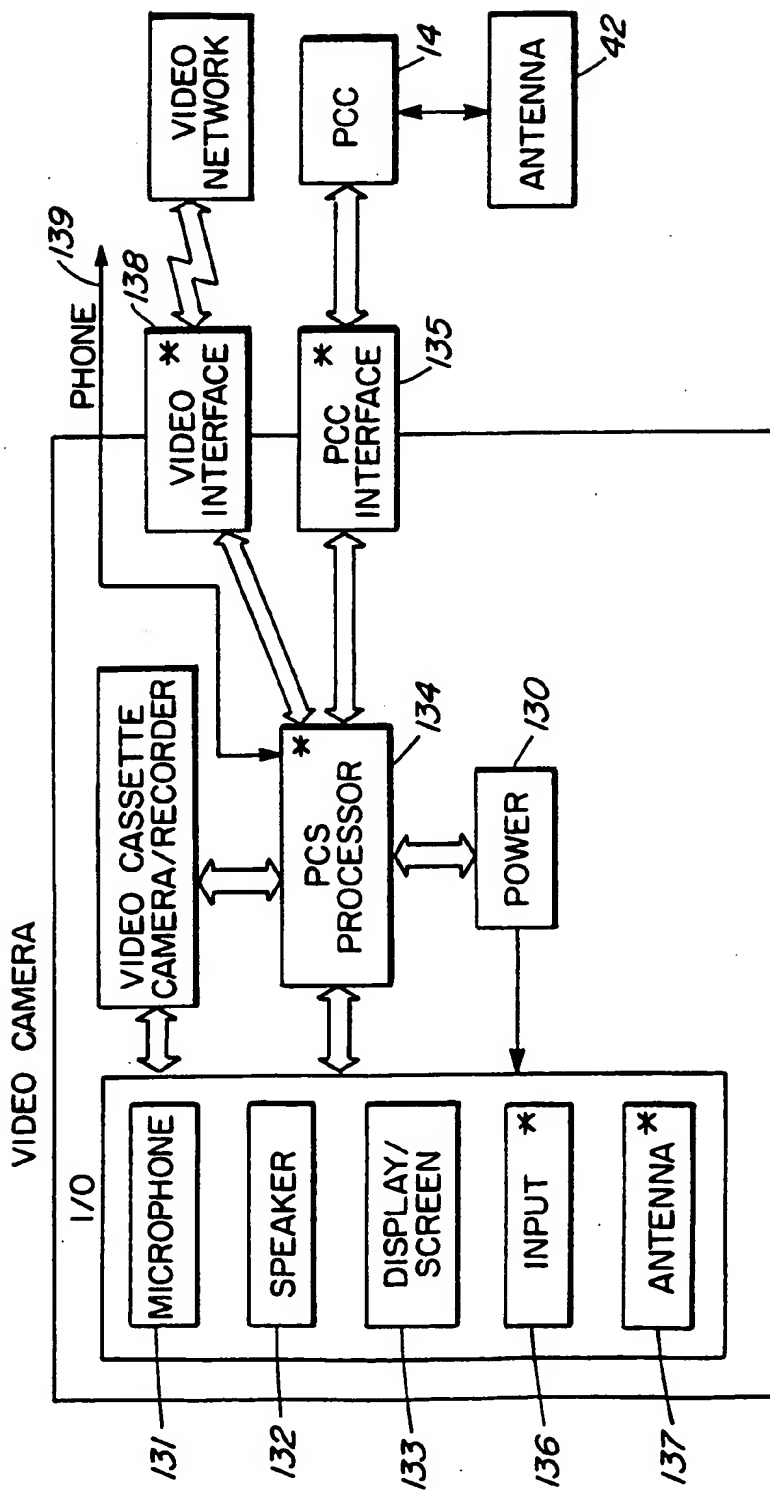
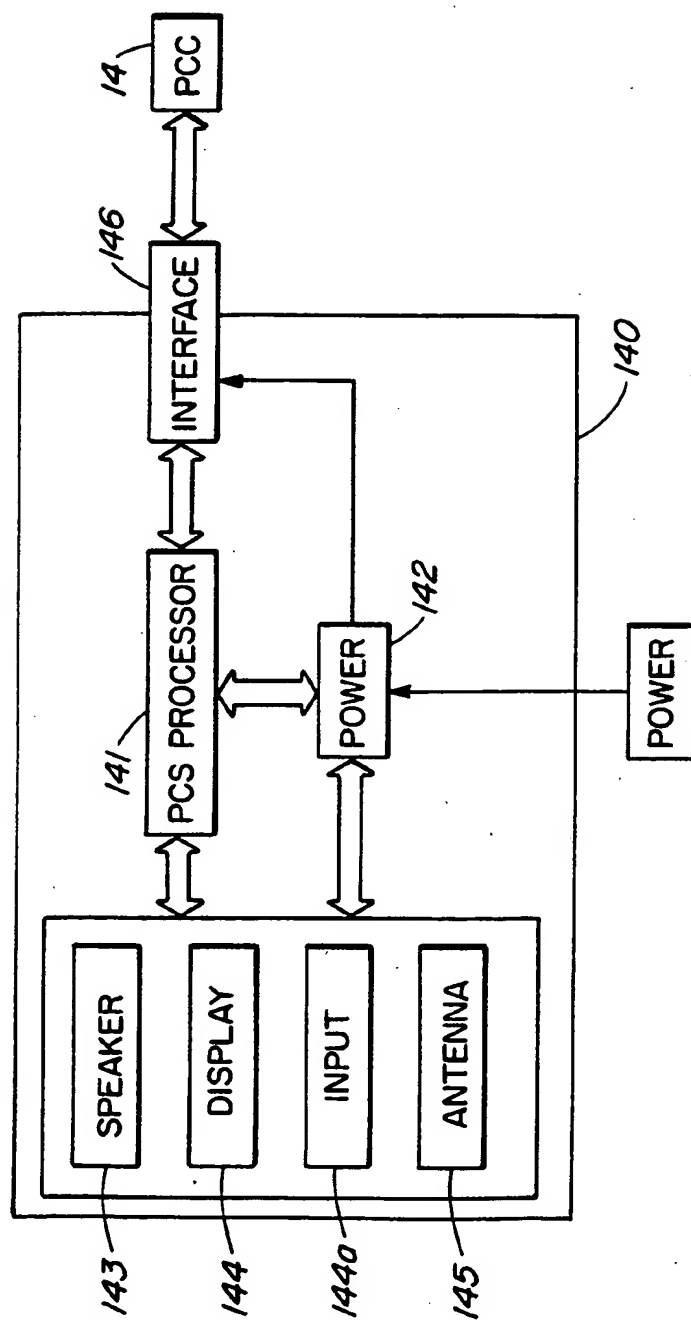


FIG. 7

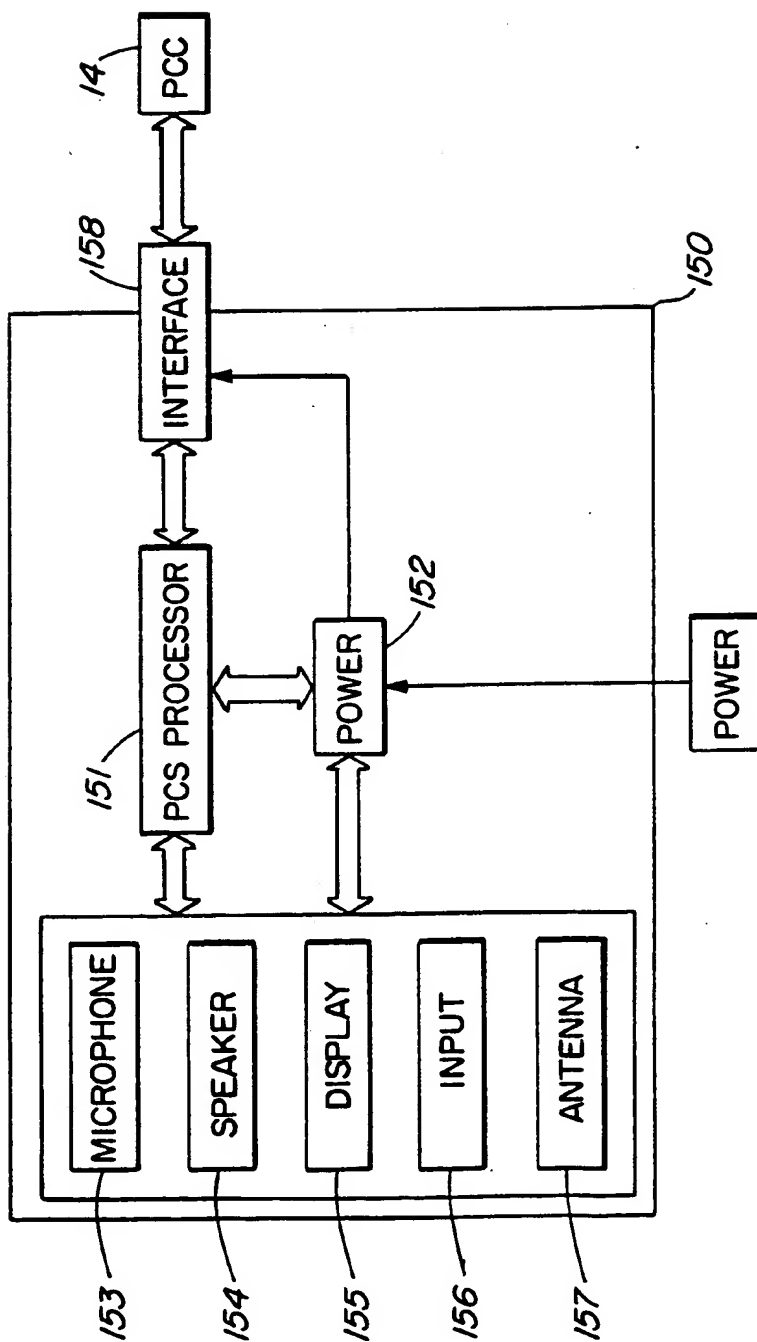
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ONE-WAY MESSAGING DEVICE

FIG. 8

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TWO-WAY MESSAGING DEVICE

FIG. 9

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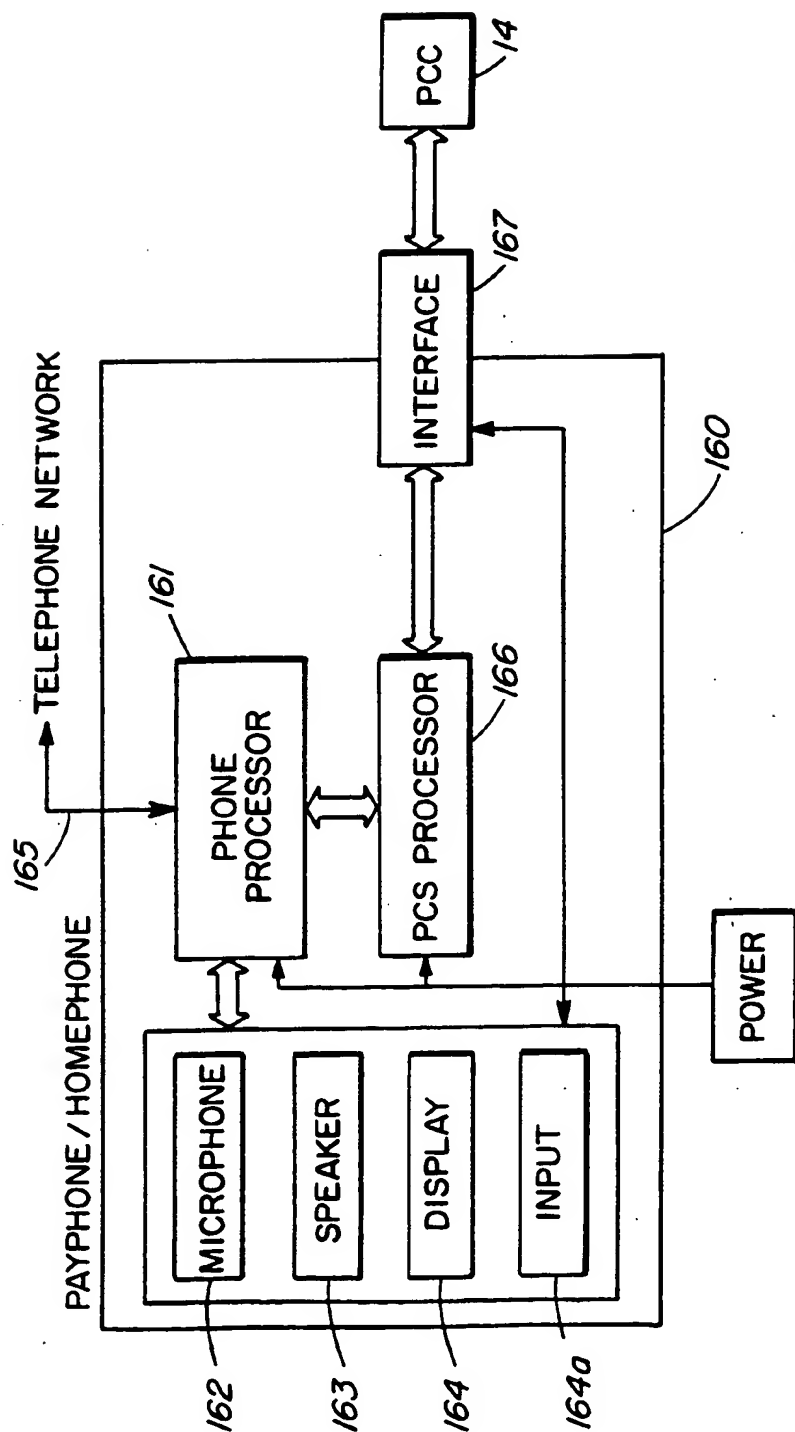


FIG. 10

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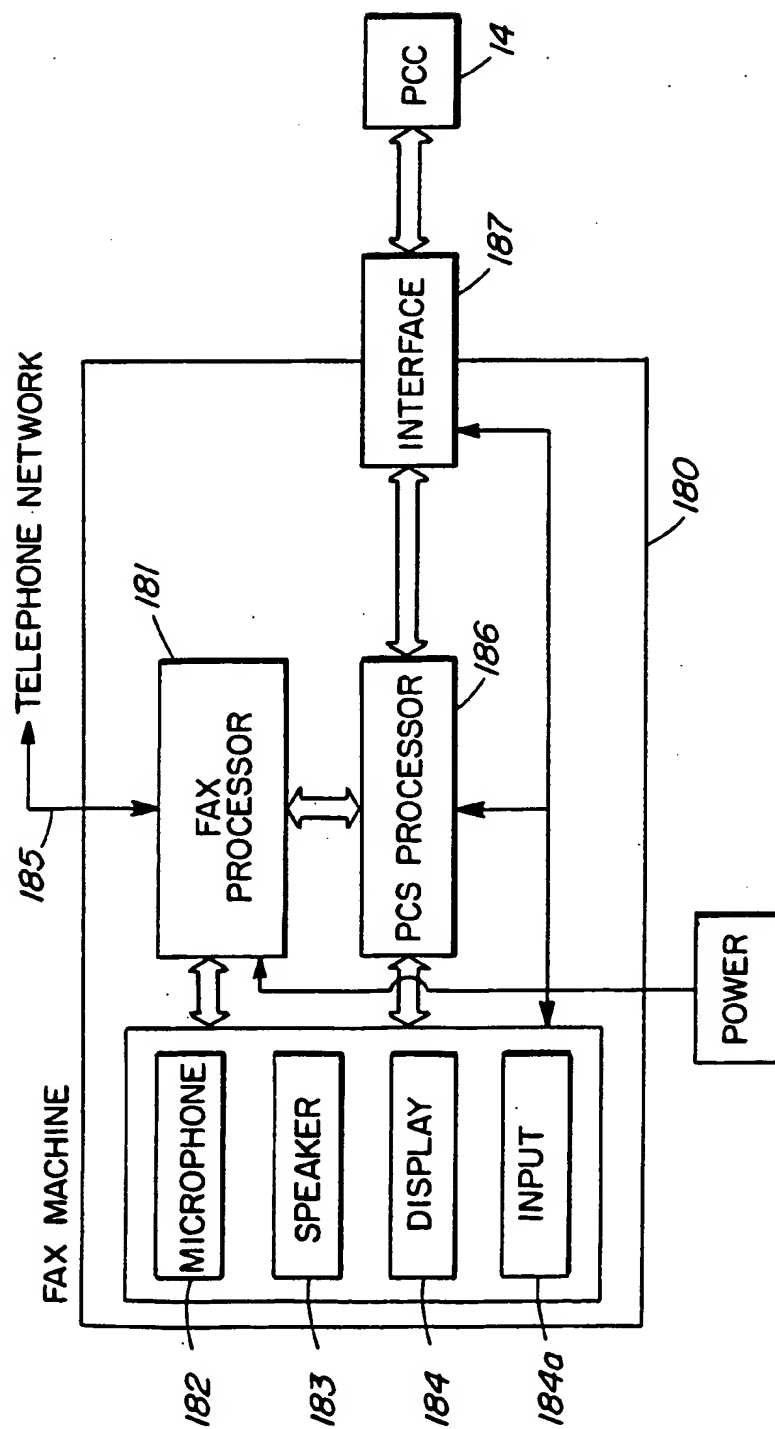


FIG. 11

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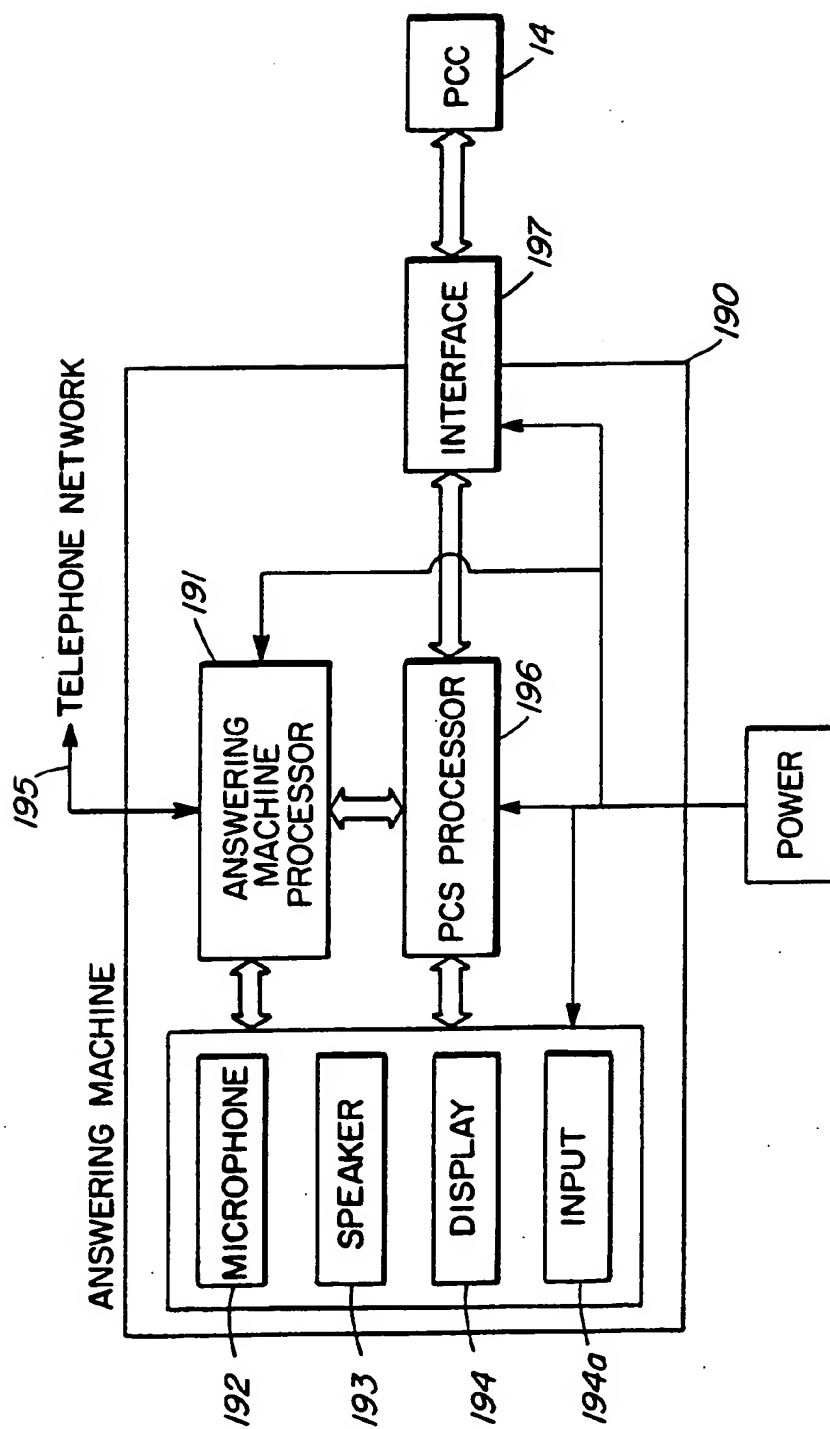


FIG. 12

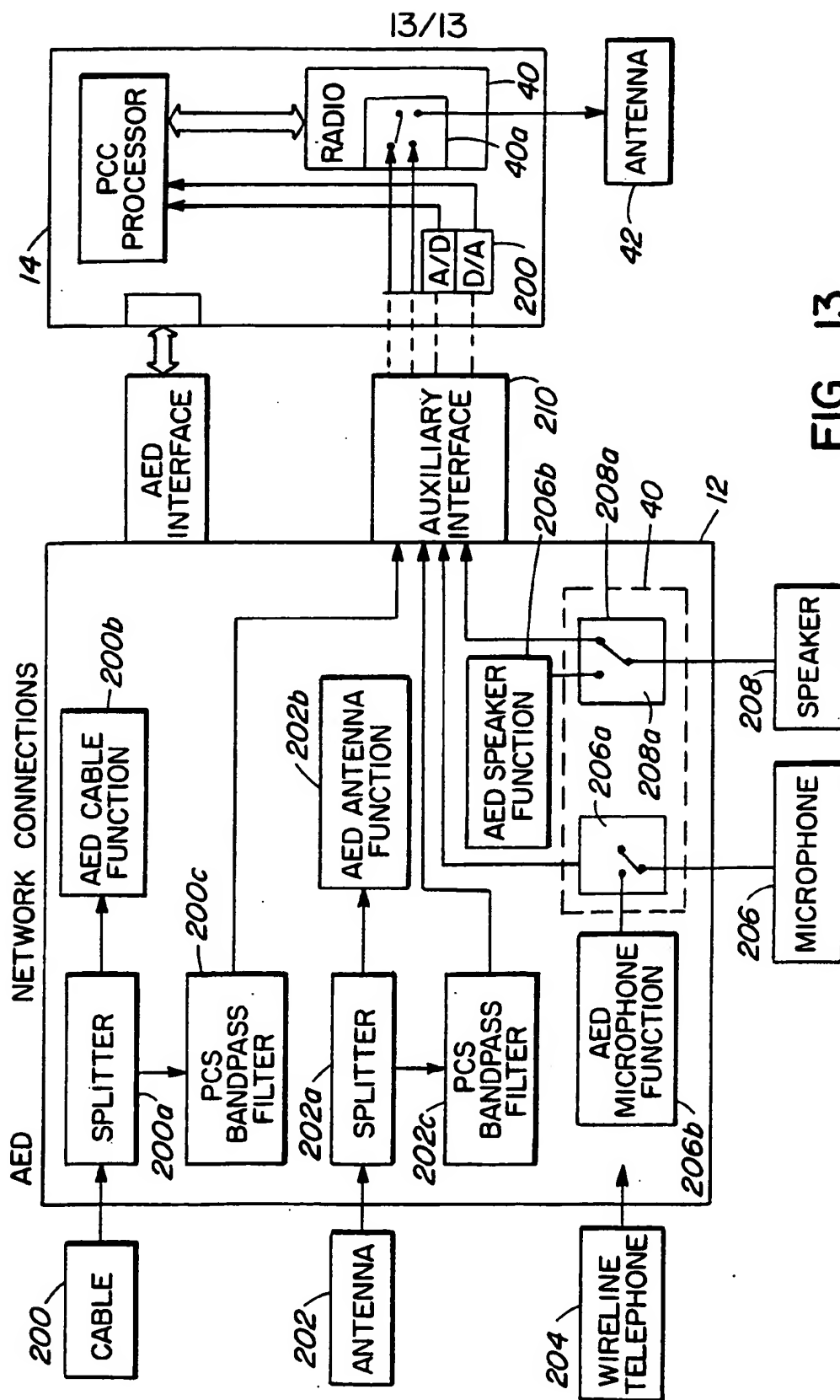


FIG. 13

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 98/00357

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B1/38 H04B1/40

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04B H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 39751 A (ERICSSON TELEFON AB L M) 12 December 1996	1,2,4, 7-9,11, 12,15, 17-23, 25-28,34
A	see abstract see page 3, line 4 - page 4, line 14 see page 9, line 8 - page 12, line 10 see page 15, line 30 - page 18, line 15 see page 21, line 6 - line 27 see figure 11 see figure 14 see figure 16 ---	5,6,10, 13,14, 16,24, 29,30, 32,33, 35,36
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

24 July 1998

Date of mailing of the international search report

31/07/1998

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Lindhardt, U

INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/CA 98/00357

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 264 613 A (PIONEER ELECTRONIC CORP) 1 September 1993	1,2,7,8, 10,12, 14,18, 19,23,25
A	see abstract	3-6,9, 11,13, 15-17, 20-22, 24, 26-28, 30,32-36
	see page 2, line 10 - page 4, line 11 see page 5, line 7 - page 8, line 6 see page 22, line 2 - page 24, line 25 see figure 1 see figure 9	
A	GB 2 289 555 A (NOKIA MOBILE PHONES LTD) 22 November 1995	1,2,4, 6-8,11, 12,15, 18-22, 30,31
	see abstract see page 1, line 11 - line 21 see page 4, line 6 - page 7, line 19 see figure 3 see figure 5 see figure 6	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. .tional Application No

PCT/CA 98/00357

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9639751 A	12-12-1996	AU 6020496 A EP 0830744 A NO 975592 A	24-12-1996 25-03-1998 23-01-1998
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